Toxic Legacies; Poisoned Futures

Persistent Organic Pollutants in Asia

GREENPEACE

November 1998

06772

Published & Printed for Greenpeace
Other Media Communications Priva
25, Navjeevan Vihar, New Delhi - 1
Tel. : 6163830, 6962871, Fax : 619
E-mail : admin@del3.vsnl.net.in

Community Health Cell
Library and Documentation Unit
367, "Srinivasa Nilaya"
Jakkasandra 1st Main,
1st Block, Koramangala,
BANGALORE-560 034.
Phone : 5531518

Toxic Legacies; Poisoned Futures

Persistent Organic Pollutants in Asia

by Von Hernandez & Nityanand Jayaraman
(with inputs from SCOPE, Karachi; NEFEJ, Kathmandu; and Society for Environment and Human Development, Dhaka)

Copyright ©1998 by Greenpeace International, Amsterdam

For more information, contact:

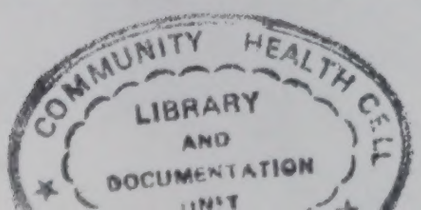
In Southeast Asia —
Von Hernandez
121 D Tuazon Ave, Sta Mesa Hts
Quezon City, Metro Manila
the Philippines
Telfax: +63 2 7401820
email: von.hernandez@dialb.greenpeace.org

In South Asia —
Nityanand Jayaraman
PO Box 3166, Lodi Road
New Delhi 110 003
Telfax: +91 11 4310651
email: nity@del3.vsnl.net.in

Greenpeace International
Keizersgracht 176, 1016DW
Amsterdam, the Netherlands
Tel: +31 20 5236222; fax: +31 20 5236200

Acknowledgments and thanks to the following:

In India: Francis John, Nirmala Karunan, Mumbai Customs, K.P. Thaddeus, Madhumita Dutta of Toxics Link, Samir Nazareth of Sristhi
In Nepal: Kunda Dixit, Prateek Bhandary and Mohan Mainali of Nepal Forum of Environmental Journalists, Poorna Manandhar, Dr. Toran Sharma
In Pakistan: Pakistan Environmental Protection Agency; Asma Hussain, Syed Qamar Raza, Tahir Abbas, Tanveer Arif and Jamil Kazmi from SCOPE, Karachi; Naila Hussain from Shirkat Gah, Lahore; Aurang Zeb; Nasira Habib from Khoj, Lahore; the staff of Sustainable Development Policy Institute, Islamabad; Dr. Parvaiz Naim, IUCN, Karachi.
In Bangladesh: Philip Gain and FMA Salam from Society for Environment and Human Development, Dhaka; Sahid Ullah Lipon, Chittagong; Mohd Reazuddin, Ministry of Environment, Dhaka.
In Thailand: Chakrit Ridmontri; Penchom Tang of Campaign for Alternative Industry Network; Saree Aongsomwang of the Coordinating Committee for Primary Health Care of Thai NGOs; Chomchuan Boonrahong, Chiang Mai; Dr. Monthip Tabucanon of Environmental Research and Training Centre, Bangkok; Jarupong Boonlong, Bangkok.
In Vietnam: Ms. Le bich Thuy and Mr. Nguyen Hoa Binh (National Environment Agency), Dr. Phan thi Phi Phi (Hanoi Medical School), Mr. Do Thanh Bai (Industrial Chemical Instutute, MOI), Ms. Odile Ruijs (NGO Resource Center), Marjon Fredrix (FAO-Vietnam IPM Programme), Dr. Giuseppe Cuboni (WHO), Prof. Hoang Dinh Cau (10-8-Committee), Dao Trong Anh (Plant Protection Department), Dr. Troung Manh Tien (Deputy Dir. Gen.-NEA), FAO-Vietnam.
In the Philippines: Junilyn Silvestre, Julius Vidal, Howie Severino, Myrla Baldonado, People's Task Force for Bases Clean-up, Tara Ledesma, Dr. Romy Quijano.
Others: Jack Weinberg, Pat Costner, Andreas Bernstorff, Anjela Wilkes



06772
E-150 N98

Toxic Legacies; Poisoned Futures
Status of Persistent Organic Pollutants in Asia

Executive Summary	1
Introduction to POPs	5
The International Context	13
Toxic Legacies	16
Emerging POPs Sources in Asia	20
Country Report — Bangladesh	34
Country Report — India	36
Country Report — Nepal	43
Country Report — Pakistan	48
Country Report — the Philippines	53
Country Report — Thailand	59
Country Report — Vietnam	63
Conclusions and Recommendations	67

Executive Summary 1
Introduction to POPs 5
The International Context 13
Toxic Legacies 16
Emerging POPs Sources in Asia 20
Country Report — Bangladesh 34
Country Report — India 38
Country Report — Nepal 43
Country Report — Pakistan 48
Country Report — the Philippines 53
Country Report — Thailand 59
Country Report — Vietnam 63
Conclusions and Recommendations 67

EXECUTIVE SUMMARY

Based on existing and evolving evidence, Greenpeace and environmentally conscious citizens and citizen groups worldwide are pursuing the elimination of one class of chemical compunds — called Persistent Organic Pollutants (POPs). POP chemicals, for reasons explained below, are among the most dangerous of life-threatening substances created by humans. Therefore, all human-induced generation of these chemicals must be rapidly phased out.

All the well-known and established POPs are chlorinated compounds. These include: pesticides such as DDT, Hexa Chloro Cyclohexanes (HCH)[1], Aldrin, Dieldrin, Endrin, Chlordane, Heptachlor, Mirex and Toxaphene; industrial chemicals such as Poly Chlorinated Biphenyls (PCBs); and unwanted industrial by-products dioxins and furans.

While Western governments have already graduated from the stage of ignorance of the problem, to denial and, now, acknowledgement and action, policy makers and citizens in the developing world remains unaware of what these chemicals are and what they can do. Unfortunately, the producers of these chemicals have done little to warn their consumers. The fear of losing the last remaining markets for their products has significantly delayed the implementation of rapid phaseouts of POP chemicals and their sources.

This report is the result of a three-month investigation by Greenpeace of the status of POPs in seven countries in Asia. Currently, very little information exists in a compiled form regarding the most pressing POP problems in Asian countries. This conveys a false sense of security to policy makers in Asia.

Through this report, Greenpeace wishes to make the case that POPs present a particularly significant problem in Asia, which is perhaps the world's largest producer and consumer of many POPs chemicals.

POPs are known to have the potential to cause irreversible and debilitating damage on entire ecosystems and species populations, including humans. The threat is made even more significant by the fact that once released into the environment, these chemicals resist degradation by natural elements and persist in ecosystems and life-forms for long durations of time.

The POPs generated by human activities have managed to contaminate even the remotest environments. Evidence of injury to some wildlife and human populations due to POPs leaves us with little doubt that unless immediate action is taken to eliminate all human-made POPs and their sources, the health of the human species and other lifeforms as a whole may be threatened.

"Both people and wildlife, everywhere in the world, carry body burdens of POPs at or near levels that can — and in some cases, clearly do — cause injury to human health and to entire ecosystems."[2] This means that the solution to global contamination lies in concerted international action to eliminate POPs from the planet. More than three decades of dedicated campaigning by scores of environmental and community activists and groups has finally resulted in the setting up of an international process under the United Nations Environment Program. With the right guidance, this process can pave the way for elimination of identified POPs chemicals and others that may be classified as POPs in the future.

We hope the right guidance will be provided by forward-thinking experts in the government and private sector and by the broad spectrum of citizens' groups and environmental organisations that continue to gather under the International POPs Elimination Network (IPEN).

IPEN argues that, "The goal of a global POPs convention must not be defined as the "better management of risks associated with POPs." POPs represent more than just a "risk." Indeed, they are a current source of significant injury to the biosphere — to humans, to wildlife and to entire ecosystems around the world. Because POPs by their very nature are unmanageable substances, the better management of POPs and POPs releases is not an appropriate goal for a global POPs convention. Rather the goals of a global convention should be to eliminate all POPs and POPs sources.

Business As Usual. . .in Asia

Chemicals now categorised as Persistent Organic Pollutants were black-listed in all western nations at least a decade ago. In Asia, a combination of factors has resulted in the continued production, trade, use and release into the environment of most of these chemicals.

A series of investigations by Greenpeace International in Pakistan, Nepal, India, Bangladesh, Thailand, Vietnam and the Philippines in 1998 revealed that:

- **Manufacturing, trade and usage of many POPs chemicals continues unabated.**
- **Obsolete POP pesticides are stored in more than 1000 stockpiles in Nepal and Pakistan under highly hazardous conditions.**
- **Lack of awareness about handling PCBs in electrical equipment may create a dangerous situation during disposal. Even Thailand which understands the dangers of PCBs continues to store PCB containing equipment in unsound conditions.**
- **Hazardous activities of the past have left behind a legacy of poisons such as in South Vietnam where war-time spraying of Agent Orange by the US armed forces has contaminated entire districts. In the Philippines, several sites in former US military bases were found to be severely contaminated with toxic chemicals including PCBs, aldrin and other persistent organic pollutants.**
- **Asia is poised for a disturbing expansion of POPs-producing technologies such as incinerators, cement kilns retrofitted for hazardous waste burning, PVC manufactories, and pulp and paper mills.**

The common thread in the hazardous POP situation in the eight Asian countries visited by Greenpeace is that in each country, citizens bear the environmental cost of POPs usage, manufacture or storage; citizens are likely to also bear the cost of its eventual disposal. Corporate accountability, extended producer responsibility and the principle of polluter pays are unheard of concepts in this region.

Some examples that demonstrate this —

- The obsolete pesticide stockpiles in Pakistan and Nepal contain chemicals from well-known chemical corporations such as Hoechst, Bayer, Shell, ICI, Velsicol, Dow, Rhone Poulenc and DuPont. Barring one instance in Pakistan where Bayer has agreed to reclaim and destroy stocks of Gusathion, none of the multinationals have come forward to accept their share of the responsibility. Meanwhile, the official position of most of the multinational companies as articulated by the Global Crop Protection Federation is that "Obsolete stocks are principally a government issue. It is clear that the principal responsibility lies with the last owner/purchaser."[3]

- Intensive promotion of DDT as the *pesticide of choice* for mosquito and other vector control led to large "donations" of this chemical to South Asian countries. Nepal, in particular, received DDT for its malaria program from the 1950s from the USAID. The USAID program was discontinued in the 1980s, nearly a decade after the chemical was banned in the US. Currently, one storage site in Southern Nepal houses 16 drums of date-expired DDT dust. Its origins are unknown but shouldn't be too difficult to find provided past records of bulk imports of DDT exist.

- Recent environmental studies commissioned by the Philippine Government confirm that the former US military bases in the Philippines are severely contaminated with persistent organic pollutants including PCBs, dieldrin, aldrin, chlordane, BHC and heptachlor. Newspaper articles in the local press report birth abnormalities and impaired intelligence among some children living near Clark. The US Government has categorically refused to be held liable for the damage to human health and environment near its former bases in the Philippines.

The POP problem in Asia — between the historic problem of stockpiles of obsolete pesticides and the continued production of POP chemicals or proposed expansion of POPs-producing technologies — is too large, complicated and expensive for individual Asian nations to handle.

The international process initiated by the United Nations Environment Program presents a suitable forum for Asian countries to air their concerns and recommend solutions.

Greenpeace urges Asian governments to participate actively in the UNEP process and to press for the adoption of the following principles -- explained in more detail in subsequent chapters -- during the ongoing POPs negotiations:

- **Polluter Pays and Corporate Responsibility:** This principle must be implemented beginning with the problem of historic contamination — stockpiles and hotspot areas. Application of this principle would, for instance, require the US Government to pay for the clean-up of the contaminated military bases in the Philippines.

- **Precautionary Principle**

- **Technological and other resource assistance** must be extended to developing country governments to phase out the remaining usage and generation of POPs, and in the identification and implementation of suitable non-chemical alternatives and systems.

- **Action Plan**: Any action on POPs must take into account the difficulty faced by developing country governments in implementing legislation. As a rule of thumb, a ban is more easily implementable than a restriction. Zero emission is easier to ensure than "regulated" emission.

- **Elimination of all POP sources:** If a substance is listed as a POP, all production and human-made sources of the substance should be eliminated in a rapid and systematic manner taking into account the specific requirements of developing countries.

In dealing with Persistent Organic Pollutants, Greenpeace advocates that:

• **For intentionally produced POP chemicals**: All production, usage and trade of intentionally produced POP chemicals be phased out in a rapid and orderly manner.

• **For POP chemicals such as dioxins and furans that are unintentionally produced during certain industrial activities or as a result of waste incineration**: The significant human-made sources of POP emissions should be identified and phased out.

• **For stockpiles of obsolete POP chemicals**: Immediate action should be taken to identify, inventory and contain obsolete POP chemicals. A system to similarly contain POP stocks that will become obsolete over the coming years should also be set up. Finally, the stocks should be disposed in a manner that do not give rise to other POP chemicals or pose a hazard to the environment or life in any manner.

Greenpeace has concluded that to afford adequate protection of both local and distant populations of humans and wildlife, the technologies, used for destroying stockpiles of persistent organic pollutants must meet the following fundamental performance criteria:4

1. **Destruction efficiencies of effectively 100 percent for the chemicals of concern:** The determination of 100 percent destruction efficiency requires the absence of any detectable concentrations of the chemicals of concern in any and all residues, using the most sensitive analytical techniques available worldwide. Analyses of the residues must be carried out sufficiently frequently to ensure compliance with this criterion during startups, shutdowns and routine operations.
2. **Complete containment of all residues** for screening and, if necessary, reprocessing to ensure that no residues contain detectable levels of chemicals of concern or other harmful constituents, such as newly formed persistent organic pollutants or other hazardous substances.
3. **No uncontrolled releases.**

ENDNOTES

[1] Hexachlorocyclohexanes (HCH) are also referred to as BHC in South Asian countries. Technical grade HCH is an insecticide, which is comprised of a mixture of different isomeric forms of HCH. The approximate isomer content is alpha-HCH (53-70%); beta-HCH (3-14%); gamma-HCH (11-18%); delta-HCH (6-10%); others (3-10%). The insecticide Lindane is the common name for the gamma isomer. Another compound that is often confused with BHC is Hexa Chlor Benzene (HCB). HCB has a variety of sources including its previous use as a fungicide for seed grain. It is produced as an unwanted by-product or impurity in the manufacture of chlorinated solvents, other chlorinated compounds such as vinyl chloride, and several pesticides. It is also produced as a by-product in waste streams of chloralkali plants and wood preserving plants, and in fly ash and flue gas effluents from municipal waste incinerators. Its main source in the environment today is from the manufacture of pesticides.

SOURCES: Allsopp M., Stringer R. and Johnston P. (June 1998). Unseen Poisons: Levels of Organochlorine Chemicals in Human Tissues. (GREENPEACE)

Foster W.G. (1995). The reproductive toxicology of Great Lakes Contaminants. Environmental Health Perspectives 103 (Suppl. 9): 63-69.

ASTDR (Agency for Toxic Substances and Disease Registry, US Public Health Service), (1997). Toxicological Profiles. CRC Press Inc.

[2] "Provisional Background Statement and POPs Elimination Platform," International POPs Elimination Network, May 20, 1998.

[3] Global Crop Protection Forum (1997). Crop Protection Industry Position on Persistant (sic) Organic Pollutants. Internet: http://www.gcpf.org/pops.html

[4] Costner P. with Luscombe D. and Simpson M. (October 1998). Technical Criteria for the Destruction of Stockpiled Persistent Organic Pollutants. Greenpeace.

INTRODUCTION

"Unless the environmental load of synthetic hormone disruptors is abated and controlled, large scale dysfunction at the population level is possible. The scope and potential hazard to wildlife and humans are great because of the probability of repeated and/or constant exposure to numerous synthetic chemicals that are known to be endocrine disruptors...."[1] Theodora E. Colborn and others (1990)

What are POPs?

Persistent Organic Pollutants (POPs) are a class of mainly synthetic toxic chemical substances that cause severe and long-term effects on wildlife, ecosystems and human health.

The general defining characteristics of POPs include:

Persistence: They're persistent in the environment; i.e. they resist breakdown by natural processes for long periods of time.

Lipophilicity: They're soluble in fatty material, including animal fat.

Bioaccumulation and Biomagnification potential: Because they are fat-soluble and resist breakdown, these chemicals tend to get stored in the fatty tissues of animals and build up (bioaccumulate) as more of the chemical is ingested over the life time of the animal. The levels of some of these chemicals increase (biomagnify) as one animal eats another, so that the highest levels are found in animals, including humans, at the top of food chains.

Long-range transportation: Once released into the environment, many POPs become airborne and may be transported for thousands of kilometres in the atmosphere before condensing and falling back to the earth's surface. POPs generally are semi-volatile — they evaporate, but relatively slowly. The colder the climate, the less POPs tend to evaporate, resulting in their migration to regions such as the Arctic, thousands of kilometers away from their original sources.

Toxicity: POPs have the potential to harm human and animal health even at very low concentrations. A wide array of effects have been documented including endocrine disruption (disruption of hormone systems), neurotoxicity, immunotoxicity, reproductive disorders and cancer.

Because of their above properties and the natural corollary that ecosystems (and lifeforms contained within such ecosystems) cannot effectively assimilate or excrete these chemicals, the International Joint Commission on Great Lakes Water Quality argues that it is "too dangerous to permit their [POPs] release in any quantity." In other words, if a human-made substance is identified as a POPs, the goal can only be elimination.

POPs include some naturally occurring substances such as polycyclic aromatic hydrocarbons (PAHs) but whose inputs to the biosphere have dramatically increased, as a result of human activities including oil and gas extraction, the combustion of fuel (including vehicles) and from the steel and non-ferrous metal industries.

However, the group of POPs that have attracted the greatest attention are synthetic organohalogens (i.e. carbon-based chemicals also containing the halogens, chlorine, bromine, fluorine or iodine). Of these, the majority are organochlorines. It is estimated that a staggering 11,000 organochlorines are now in use around the world. They include pesticides such as DDT, Chlordane, Heptachlor, Aldrin, Dieldrin, Endrin, Toxaphene, and Mirex; solvents such as perchlorethylene; and chemicals with multiple uses such as Poly Chlorinated Biphenyls (PCBs). Also included are organochlorine by-products such as hexachlorobenzene, dioxins and furans.

Of the above compounds, the United Nations Environment Program has shortlisted twelve chemicals (all barring perchlorethylene) for global action. The United Nations Economic Commission on Europe Convention on Long-Range Transboundary Air Pollution negotiations for a protocol on POPs name six additional compounds — hexabromobiphenyl, Pentachlorophenol, short-chain chlorinated paraffins, chlordecon, lindane and polyaromatic hydrocarbons.[2]

Cause for Concern

To a lay person, a substance is a poison only if it causes immediate death after exposure, or cancer in the long-term. But a growing body of evidence points to much more insidious and devastating effects that some POPs can have on human and environmental health. Many POPs damage the immune system of life forms making them vulnerable to sickness, ailments and eventual death. Some POPs are also known to mimic hormones, disrupt endocrine systems and affect fertility in humans and wildlife. By decreasing fertility, POPs are capable of threatening entire populations of life forms.

> ***"As we put our babies to our breasts, we feed them a noxious chemical cocktail that foreshadows neurological disorders, cancer, kidney failure, reproductive dysfunction etc."*** Sheila Watt-Cloutier, vice president (Canada), Inuit Circumpolar Conference. June 28, 1998, Montreal, Quebec.

POPs can be transported long distances. For example, toxaphene used as a pesticide on cotton in the Carribbean and Central America, is conveyed all the way across the Atlantic, to appear in significant amounts in the northern North Sea. Similarly, the transportation of POPs to the cold arctic environment from lower latitude areas where the chemicals may have been released, is believed to account for the surprisingly high concentrations of POPs in arctic environments. Once in the arctic, many POPs enter the food web bioaccumulating and concentrating in whales, seals, polar bears, fish and other animals eaten by the indigenous people such as the Inuit.

"Depending on the type and the amount of country food consumed, many Inuit have levels of certain POPs in their bodies well in excess of "levels of concern" defined by the Canadian Department of Health."[3] The levels of some POPs are reported to be 10 to 20 times higher than found in people living in most temperate regions.

POPs can also have deadly consequences for people who live or work in close proximity to these chemicals. Such vulnerable populations include agricultural workers exposed to pesticides,

subsistence farmers, people in manufacturing industries, as well as those who depend on food from areas — including lakes and high-latitude seas — contaminated by POPs.

A study of HCH levels among workers in an HCH manufacturing plant reported levels three times higher than control among workers involved in maintenance work, and five times higher among plant operators and supervisors. The most severely exposed were the handlers in direct contact with the insecticide; the had HCH residues 12 times higher than controls.[4]

Farmers who raise and consume their livestock have the potential for elevated exposures, specifically those located within the vicinity of organochlorine sources. For example, elevated concentrations of dioxins and related organochlorines have been documented in milk produced near municipal and industrial waste incinerators, as well as other industries.[5]

Studies have also found elevated levels of certain organochlorine in the tissues of chemical workers involved in the manufacture of chlorophenolic compounds as well as in workers at municipal waste incinerators.[6]

It's Happening in Asia

These findings are particularly troublesome for Asia, home to two of the largest remaining POPs producers — India and China — in the world. Both China and India are known to manufacture, use and export DDT, a chemical that has been blacklisted since the 1960s. DDT's impacts on the environment and its injury to wildlife health is well documented. DDT, for example, is implicated in the near extinction of the bald eagle and the brown pelican around the Great Lakes ecosystem in North America.[7] In India, though, DDT alongwith HCH, together accounted for more than 70 percent of the total pesticide consumption.[8]

Predictably, some Indians have the dubious distinction of carrying among the highest levels of DDT and HCH in their bodies. "Exceptionally high levels of beta-HCH in breast milk were evident in India (4.37 to 8.83 ppm). . .An infant's estimated intake of lindane (gamma-HCH) from breast milk in India, based on mean levels of breast milk fat, exceeds the ADI (Allowable Daily Intake) by 11-20 times."[9] In recent years, evidence has grown that elevated concentrations of DDE, a breakdown product of DDT, are associated with reduced lactation by human mothers.[10]

In countries like India, Bangladesh, Vietnam and the Philippines, where breast feeding is not a choice but the only nutrition available to millions of newborns, effects such as these can be disastrous.

An April 1993 study in the Journal of the National Cancer Institute reported a significant and strong association between blood levels of DDT/DDE and breast cancer, and an elevated risk of breast cancer associated with PCBs. Although, the latter association was not statistically significant, the journal's managing editor referred to it as a "wake-up call."[11] However, subsequent studies have established stronger correlations between breast cancer and human-made environmental poisons.

Water samples taken from Thailand's Chao Phraya River during 1988 to 1995 revealed the presence of organochlorine pesticides such as HCHs, DDTs, aldrin, dieldrin and chlordanes.[12]

In South Vietnam, health effects due to the spraying of Agent Orange contaminated with dioxin by the United States armed forces during the Vietnam war reportedly manifest themselves with disturbing regularity among exposed populations. In general, levels of dioxins and furans in tissue or environment were found to be considerably lower in less industrialised countries/

areas, such as Thailand, China, Pakistan, northern Vietnam and Russia. However, in South Vietnam, the levels of dioxins and furans in breast milk were found to be the highest among the countries studied. The levels were higher than those in USA, Canada, Japan and Germany.[13]

A shocking study from the Institute of Food Radiation Biology of Bangladesh reported 50 parts per million to 100 parts per million of DDT in many of the locally marketed dry fish samples. The DDT was believed to have been used as an insecticide during the fish-drying process.[14]

Unfortunately, though, much of the literature regarding presence of POP chemicals in environment, wildlife and humans is restricted to the Northern countries. But absence of evidence is not evidence of absence. Rather, going through a series of logical steps, it becomes irrefutably clear that Asian countries that continue to manufacture, use, store or unintentionally produce POPs are not merely poisoning distant lands, but also putting at risk their own people and environment.

What little literature is available from Thailand, India, Vietnam, the Philippines and Pakistan, seen together with the poor enforcement of environmental regulation leaves little room for doubt that injury from POPs contamination is not only possible, but is ongoing.

Findings of Greenpeace Investigation of POP Problems in Select Asian Countries, 1998

Country	Stockpile	Hotspots or Reservoirs	Production	Import/ export	POPs-producing technology
Bangladesh in Chittagong	Confirmed	DDT factory confirmed	No	Imports	No
India	Reported	Not known	Confirmed	Confirmed	Medical waste incinerators; PVC factories; metal smelting
Nepal	Confirmed	Not known	No	Imports confirmed	No
Pakistan	Confirmed	Malir stockpile, Karachi	No (formulation ongoing)	Imports reported	Medical waste incinerators
Philippines	PCB stockpiles reported	Former US military bases	Not known	Imports reported	Medical waste, garbage incinerators.
Thailand	Confirmed PCB stockpile; Confirmed pesticide stockpile.	Possible hotspot at pesticide burial site in Uttaradit, Sukhothai.	Not known	Imports reported	Medical waste incinerators, PVC factories, municipal and hazwaste incinerators
Vietnam	Unknown	South Vietnam	No	Imports confirmed	Not known

SOURCE: Greenpeace research and interviews, 1998

If the presence of POPs chemicals in the environment has led to exposure, accumulation and, in certain cases, injury among human and wildlife populations in developed countries, it stands to reason that the same would apply to lifeforms in developing countries where these chemicals are known to be used or present in environment.

In fact, even the meagre body of literature on POPs or chlorinated compounds contains some studies that indicate that injury to human and wildlife population in Asia may already be happening.

An indicative inquiry into the possible causes of the unsuccessful breeding pattern of the greyheaded fishing eagle in North India's Corbett National Park have tentatively implicated organochlorine pesticides, specifically DDT, aldrin and dieldrin. Eggshell fragments collected from one nest were found to contain detectable levels of DDT, dieldrin and PCBs. "These contaminants could have been passed on only through the prey base, which for this species is solely fish. The presence of these contaminants in the local riverine food web is, therefore a plausible cause of at least some of its [eagle's] unsuccessful breeding attempts in Corbett National Park.[15]

More disturbingly, some experts predict that while levels of some POPs may actually decrease with time in many developed countries, the body burdens in most developing nations will remain stable (in the case of DDT, HCH and chlordanes) or even increase (as in the case of PCBs).[16]

Such prolonged contamination may be due to "continuous emission of PCBs from recently used and/or dumped transformers and capacitors which contain 65 percent of the total PCBs produced." However, in most Asian countries, the government remains unaware of whether their electrical equipment contain PCBs.

In the case of Thailand, the government has acknowledged the presence of PCB-containing electrical equipment and taken steps to isolate them. But as one study reveals, the storage site for PCB-containing transformers is itself acting as a point source for PCB emission.[17]

The Injury

Before exploring the evidence of POPs-related injuries to human and wildlife health, it is essential to clarify two issues:

1. It is difficult to aver that an observed injury to an individual or specie population is a direct result of a specific POP chemical. That is because POPs almost always occur in mixtures in the environment; their combined effect may sometimes be different and more pronounced than the sum of their individual effects.
2. POPs related injuries often fail to manifest in the adults exposed to POPs. Rather, the impacts may occur in the offspring generation. "Maternal body burdens of POPs are transferred through the placenta to the developing foetus and through the breast milk to the nursing infant, and can cause injury at vulnerable stages of development may not be expressed until the infant reaches puberty or adulthood."[18]

The first evidence of injury began to be discovered in North America in the 1960s with the finding that the declining populations of peregrine falcon in North America were due to DDE-induced egg shell thinning.[19] The evolving body of evidence thereafter indicated that documented injuries were more prevalent in high predator species. These included:[20]

- reproductive failure and population decline;
- abnormally functioning thyroids and other hormone system dysfunctions;
- feminisation of males and masculisation of females;
- compromised immune systems;
- behavioral abnormalities;
- tumors and cancers;
- gross birth defects.

Investigation of possible impact on human beings yielded similar results.[21]

- cancers and tumors at multiple sites;
- neurobehavioral impairment including learning disorders, reduced performance on standard tests and changes in temperament;
- immune system changes;
- reproductive deficits, such as infertility and sex-linked disorders;
- a shortened period of lactation in nursing mothers;
- diseases such as endometriosis, increased incidence of diabetes.

One study reported that a group of Indian men who worked with organochlorine pesticides such as DDT was found to have decreased fertility when compared to a less exposed control group. There was also a significant increase in still births, neonatal deaths and congenital defects in children born to these men.[22]

Of particular concern is evidence suggesting that women, infants, and children are especially vulnerable to certain effects of POPs. For instance, one 1993 study reported an association between blood levels of DDT/DDE and breast cancer, and an elevated (but not statistically significant) risk of breast cancer associated with PCB.[23]

Another study[24] of women from around the Lake Michigan area reported that women who ate several meals of Lake Michigan fish in a month for at least six years prior to their pregnancies bore children who had lower birth weights, shorter gestational periods and smaller head circumferences at birth. Also, these children when tested later showed discernible cognitive, motor and behavioral deficits compared to infants born of women who had not consumed Lake Michigan fish. Lake Michigan, one of the Great Lakes in North America, is a sink for a variety of pollutants including POPs.

Adding to the concern are new discoveries that implicate many POP chemicals in endocrine and hormonal disruption. "Many compounds introduced into the environment by human activity are capable of disrupting the endocrine system of animals, including fish, wildlife, and humans. The consequences of such disruption can be profound because of the crucial role hormones play in controlling development. . ."[25]

---

[1] Theodora E. Colborn and others, GREAT LAKES GREAT LEGACY? (Washington, DC: Conservation Foundation, 1990), pg. 139.

[2] Wahlstrom B. (Nov. 1997). "Alternatives to Persistent Organic Pollutants," in UNEP (eds) "Proceedings of the Subregional Awareness Raising Workshop on POPs." Bangkok.

[3] Watt-Cloutier, S. vice-president (Canada) Inuit Circumpolar Conference. Speech delivered at International POPs Elimination Network — Public Forum on Persistent Organic Pollutants: The Need for a Strong Treaty." June 28, 1998, Montreal, Quebec.

[4] Nigam S.K., Karnik A.B., Majumder S.K., Visweswariah K., Raju G.S., Bai K.M., Lakkad B.C., Thakore K.N., Chatterjee B.B. (1986). Serum Hexachlorocyclohexane Residues in Workers Engaged at a HCH Manufacturing Plant. Int. Arch Occup Environ Health (1986) 56:315-320.

[5] Cited in "Body of Evidence: The Effects of Chlorine on Human Health." Greenpeace Report, May 1995. **See also** Liem A.K.D., Hoogerbrugge R., Koostra P.R., Van der Velde E.G., De Jong A.P.J.M. (1991). Occurrence of dioxins in cow's milk in the vicinity of municipal waste incinerators and a metal reclamation plant in the Netherlands. Chemosphere 23: 1675-1684.

See also de Jong A.P.J.M., van der Heeft E., Marsman J.A. and Liem A.K.D. (1992). Investigation on the Occurrence of polyhalogenated dibenzodioxins and dibenzofurans in cow's milk and fish tissue. Chemosphere 25 (7-10): 1551-1557

See also Lassek E., Jahr D. and Mayer R. (1993). Polychlorinated dibenzo-p-dioxins and dibenzofurans in cow's milk from Bavaria, FRG. Chemosphere 27(4): 519-34

See also Beck H., Dross A., Mather W., and Wittkowski R. (1990). Influence of different regional emissions and cardboard containers on levels of PCDD, PCDF and related compounds in cow milk. Chemosphere 21 (6): 789-798.

[6] Greenpeace (May 1995). Body of Evidence: The Effects of Chlorine on Human Health.

[7] Cited in "A Strategy for Virtual Elimination of Persistent Toxic Substances — Vol 1." Report of the Virtual Elimination Task Force to the Joint Commission, Windsor, Ontario. August 1993.

[8] Nair A., Mandapati R., Dureja P. and Pillai M.K.K (1996). DDT and HCH Load in Mothers and Their Infants in Delhi, India. Bulletin of Environmental Contamination and Toxicology 56: 58-64.

[9] Allsopp M., Stringer R. and Johnston P. (June 1998). Unseen Poisons: Levels of Organochlorine Chemicals in Human Tissues. Greenpeace.

[10] Gladen B.C., Rogan W.J. (1995) DDE and shortened duration of lactation in a northern Mexican town. AJPH Vol. 85(4): 504-508

[11] As cited in "A Strategy for Virtual Elimination of Persistent Toxic Substances: Vol. 2." Report of the Virtual Elimination Task Force to IJC, Ontario, August, 1993.

[12] Boonyatumanond R., Tabucanon M.S., Siriwong C. and Prinyatanakun P. (1996) Concentration of Organochlorine Pesticides in the Chao Phraya River, Thailand. Journal of Environmental Chemistry, vol.6 (2) pp. 195-201.

[13] Allsopp M., Stringer R. and Johnston P. (June 1998). Unseen Poisons: Levels of Organochlorine Chemicals in Human Tissues. Greenpeace

[14] Sarkar A. Vegetable & Dry Fish Eaters, Beware. The Morning Sun, Dhaka, May 31, 1995.

[15] Naoroji R. Contamination in Egg Shells of Himalayan Grey Headed Fishing Eagle *Ichthyophaga Nana Plumbea* in Corbett National Park, India. Journal Bombay Natural History Society Vol 94 (1997). pp. 398-400

[16] Loganathan B.G. and Kannan K. (May 1994) Global Organochlorine Contamination Trends: An Overview. Ambio vol.23 (3). page 188.

[17] Watanabe S., Laovakul W., Boonyathumanondh R., Tabucanon M.S. and Ohgaki S. (1996) Concentrations and Composition of PCB Congeners In the Air Around Stored Used Capacitors Containing PCB Insulator Oil in a Suburb of Bangkok, Thailand. Environmental Pollution Vol. 92 (3). pp. 289-297.

[18] "Provisional Background Statement and POPs Elimination Platform," International POPs Elimination Network, May 20, 1998.

[19] Han, S. (June 1994). An Overview of Persistent Organic Pollutants in the Environment. Report prepared for the Task Force on Persistent Organic Pollutants, Convention on Long-range Transboundary Air Pollution. page 17.

[20] "Provisional Background Statement and POPs Elimination Platform," International POPs Elimination Network, May 20, 1998.

[21] "Provisional Background Statement and POPs Elimination Platform," International POPs Elimination Network, May 20, 1998.

[22] Rupa D.S., Reddy P.P. and Reddi O.S. (1991). Reproductive Performance in Population Exposed to Pesticides in Cotton Fields in India. Environmental Research 55: 123-128.

[23] Wolff, M.S. et al. (April 21, 1993) Blood Levels of Organochlorine Residues and Risk of Breast Cancer. Journal of the National Cancer Institute. Vol 85 (8). pp. 648-652

[24] Cited in "A Strategy for Virtual Elimination of Persistent Toxic Substances — Vol 2." Report of the Virtual Elimination Task Force to the Joint Commission, Windsor, Ontario. August 1993.

See also, Government of Canada (1991). Toxic Chemicals in the Great Lakes and Associated Effects. Vol. II — Effects. Ottawa, Ontario, Canada. pp. 495-755

See also, Schneider S. (ed.) (September 27-28, 1991). Cause-Effect Linkages II. Symposium Abstracts. Michigan Audubon Society, Lansing, Michigan. 46pp

See also, Jacobson J.L. and Jacobson S.W. (1991) "Follow-up on Children from the Michigan Fish-eaters Cohort Study: Performance at Age 4" in Cause Effect Linkages II Symposium Abstracts, op cit.

See also, Swain W. et al. (1992) Exposure and Effects of Airborne Contamination. Chapter 2.2 for the Great Waters Program Report. Manuscript prepared for the US Environmental Protection Agency. 201 pp.

See also, Flint W. and Vena J. (1992). Risks to Human Health Associated with Exposure to Toxic Chemicals in the Great Lakes Basin Ecosystem. [Lewis Publishers, Chelsea, Michigan]

See also, Jacobson J.J. et al (1990). Effects of in utero exposure to polychlorinated biphenyls and related contaminants on cognitive functioning in young children. J. Pediatrics 116:38-4

See also, Jacobson J.J. et al. (1990). Effects of exposure to PCBs and related compounds on growth and activity in children. Neurotoxicology and Teratology. vol 12. pp. 319-326

See also, Swain W.R. (1988) Human Health Consequences of Consumption of Fish Contaminated with Organochlorine Compounds. Aquatic Toxicology 11:357-377.

See also, Fein G. et al (1984). Prenatal Exposure to Polychlorinated Biphenyls: Effects on Birth Size and Gestational Age. Journal of Pediatrics: 105:315-20

See also, Swain W.R. (1991). "Effects of Organochlorine Chemicals on the Reproductive Outcome of Humans who Consumed Contaminated Great Lakes Fish: An Epidemiological Consideration." In Gilbertson M and Schneider R.S. (eds) Special Issue: International Joint Commission Workshop on Cause-Effect Linkages. Journal of Toxicology and Environmental Health. Vol 33 (4). pp.587-640.

[25] Montague P. (December 1991). The Wingspread Statement — Part I: Chemicals in Environment Affect Sexual Development in Wildlife and Humans. RACHEL'S HAZARDOUS WASTE NEWS #263

THE INTERNATIONAL CONTEXT

"…. persistent toxic substances have caused widespread injury to the environment and human health. As a society, we can no longer afford to tolerate their presence in our environment and in our bodies … Hence if a chemical or group of chemicals is persistent, toxic or bioaccummulative, we should immediately begin a process to eliminate it. Since it seems impossible to eliminate discharges of these chemicals through other means, a policy banning or sunsetting their manufacture, distribution, storage, use and disposal seems to be the only alternative."

The International Joint Commission of the Great Lakes Water Quality Agreement

The preponderance of evidence worldwide pointing to the threat to human health and the environment posed by POPs has prompted the international community to act urgently. The fact that POPs tend to travel long distances and cross international boundaries has also served to underscore the need for regional and international solutions to this global environmental threat.

Cognizant of the international nature of the problem, governments of the world under the auspices of the United Nations Environment Program (UNEP) have decided to come together to negotiate an international instrument to address the use, production and release of POPs. Starting with the 12 substances initially shortlisted by the UNEP for priority action, this process is expected to culminate in the adoption of a legally-binding Convention by the year 2000. The objective of the Convention would be to reduce, hopefully with the aim to eliminate, all human-made uses and sources of persistent organic pollutants.

The short-listed substances slated for international action include the most notorious pesticides most of which have been banned in many countries such as aldrin, endrin, DDT, chlordane, heptachlor, toxaphene, hexachlorobenzene, dieldrin and mirex, the industrial chemical PCBs or polychlorinated biphenyls, and unintentional by-products — dioxins and furans.

The decision to negotiate an international legally-binding treaty on POPs is actually the culmination of a series of meetings spearheaded by the UNEP's subsidiary bodies such as the Intergovernmental Forum for Chemical Safety (IFCS) and the Inter-Organization Program on the Sound Management of Chemicals. The latter was established to promote coordination among international organizations involved in implementing commitments embodied in Chapter 19 of Agenda 21 (of the Rio Declaration) involving the environmentally sound management of toxic chemicals.

In pursuance of commitments embodied in Agenda 21, the UNEP called for an Intergovernmental Conference for the Protection of the Marine Environment from Land-based Activities in Washington

D.C. in October 1995 where ministers from 110 countries agreed to develop a "global, legally binding instrument for the reduction/and or elimination of emissions, discharges, and where appropriate, the manufacture and use" of the earlier identified 12 substances.

Building on the outputs of this and other earlier related meetings, the UNEP together with the World Health Organization (WHO) agreed to convene an Intergovernmental Negotiating Committee (INC) to establish the terms of a possible instrument on POPs. That first INC meeting took place in June 1998 in Montreal, Canada.

The Montreal INC concluded with all representatives supporting the completion of an international legally binding instrument on POPs by the year 2000. The meeting also sought the creation of an expert group to determine criteria and procedure for identifying additional POPs as candidates for future action. Many delegates stressed the need to apply the precautionary principle in the procedure for identifying and controlling POPs.

While the road ahead appears paved in favor of the adoption of a legally-binding Convention on POPs, several challenges remain, particularly with respect to the final outcome of this process. For instance, the final agreement is expected to take into account the special and more urgent needs of developing countries in dealing with their stockpiles of obsolete POPs pesticides and developing the wherewithal to effectively clean-up contaminated sites.

The development of suitable, non-chemical alternatives to POPs still in use in many developing countries should be seen as a matter requiring urgent action by the international community. Correspondingly, a global commitment to reduce and eradicate POPs from the planet would require the provision of resources to developing countries. In the long-term, and following the logic of the precautionary principle, the evolving POPs instrument must be seen as a resolute step by the international community to purge the planet of persistent poisons and veer humanity away from it's dependence on toxic chemicals and highly polluting production processes.

For the agreement to be effective, it must be able to force the implementation of the right set of solutions and measures to eliminate the production of persistent pollutants. Such pollution prevention measures would include pesticide reduction programs, pollutant release and transfer registers, and clean production.

A number of international meetings have also addressed similar issues related to the POPs agenda of the UNEP.

BARCON and OSPAR Conventions

In June 1995, Parties to the Barcelona Convention[1] for the Protection of the Mediterranean Sea against Pollution agreed to the reduction by the year 2005 of discharges and emissions which could reach the marine environment, of substances which are toxic, persistent and liable to bioaccummulate, in particular organohalogen substances, to levels that are not harmful to man (sic) or nature, with a view to their gradual elimination."

This complements earlier developments in the OSPAR (Oslo and Paris) Conventions for Preventing Marine Pollution in the North East Atlantic where in 1992 Contracting Parties[2] agreed in a Ministerial Direction that:

"As a matter of principle for the whole Convention area, discharges and emissions of substances which are toxic, persistent and liable to bioaccummulate, in particular organohalogen substances, and which could reach the marine environment should, regardless of their anthropogenic source

be reduced by the year 2000, to levels that are not harmful to man or nature with the aim of their elimination"

Prior Informed Consent Convention

In March 1998, after two years of negotiations, representatives from 95 governments completed negotiations for an international legally binding treaty on the Prior Informed Consent Procedure for Certain Chemicals and Pesticides in International Trade (PIC Convention). The agreement includes 22 pesticides[3] and five industrial chemicals already covered by the voluntary PIC procedure with the possibility of more substances being added.

The aim of the Convention is to allow importing countries to decide which chemicals they want to allow entry, considering their capacities to manage, use, store and even process these chemicals. This Food and Agriculture Organization (FAO) and UNEP-sponsored Convention which was signed and adopted on September 1998 at a diplomatic conference in Rotterdam, makes the PIC procedure mandatory and not voluntary as previously practiced among the Parties. The provisions state that hazardous products and pesticides that are banned or strictly regulated in at least two countries may be exported only with the specific consent of the importing country.

LRTAPs Negotiations

Meanwhile, under the auspices of the UN Economic Commission for Europe (UN/ECE) , the Convention on Long-Range Transboundary Air Pollution (LRTAP) recently concluded negotiations for a protocol on 16 POPs.

On June 1998, 32 countries and the European Community signed the protocol which aims to control, reduce or eliminate discharges, emissions, and losses of persistent organic pollutants within the countries of the ECE area. The protocol bans the production and use of some products outright (aldrin, chlordane, chlordecone, dieldrin, endrin, hexabromobiphenyl, mirex, toxaphene); schedules others for elimination at a later stage (DDT, heptachlor, HCB, PCBs); and severely restricts the use of DDT, HCH (including lindane), and PCBs. It also obliges countries to reduce their emissions of dioxins, furans, PAHs, and HCB below their 1990 levels and provides for best available techniques to cut emissions of these POPs.

---

[1] The Contracting Parties to the Barcelona Convention are Albania, Algeria, Bosnia, Croatia, Cyprus, Egypt, The EU, France, Israel, Italy, Lebanon, Malta, Monaco, Morocco, Portugal, Spain, Slovenia, Syria, and Tunisia.

[2] *Contracting Parties to OSPAR are Belgium, Denmark, the EU, Finland, France, Germany, Iceland, Ireland, the Netherlands, Norway, Portugal, Spain, Sweden, and the United Kingdom

[3] Pesticides banned or severely restricted : 2,4,5-T, aldrin, captafol, chlordane, chlordimeform, chlorbenzilate, DDT, dieldrin, dinoseb and dinoseb salts, 1,2-dibromoethane, fluoroacetamide, HCH (mixed isomers), heptachlor, hexachlorobenzene, lindane, mercury compounds used in agriculture, pentachlorophenol. Severely hazardous pesticide formulations: monocrotophos, methamiodophos, phospamidon, methyl parathion, parathion.

TOXIC LEGACIES

"Any doctor will tell you that dioxine (sic), like vitamins, is essential for human health and injurious only when taken in excess."

The Indian Non-Ferrous Metal Manufacturers' Association in "Rejoinder to Greenpeace." 1995.

The story of POPs in Asia is one of widespread contamination as a result of irresponsible corporate behavior, shortsighted lending agencies, ignorant governments and an unwitting citizenry. In several countries, particularly in South Asia, the condition is very serious.

Often, the solutions proposed to several of the POPs-related problems are as dangerous as the problem, especially because they fail to evaluate the "solutions" in the context of the Asian countries where they may be implemented.

Take for instance the solutions proposed for "disposal" of obsolete pesticides — burning in cement kilns. Both DANIDA and USAID seem convinced that cement kiln incineration has a role to play in disposal of pesticide stockpiles. They claim it works in the US and in Denmark, although even the United States Environmental Protection Agency admits that hazardous waste burning cement kilns are the second largest dioxin source in the US. However, the issue is not all about technology. In both the US and Denmark, the legislative framework, though not perfect, has provisions that allow citizens to be informed about the hazardous activities in their areas. This serves as a deterrent to irresponsible behavior. None of the Asian countries have any "Right to Know" legislation worth the mention.

Further, in the USA and Denmark, at least limited monitoring of the hazardous waste treatment facilities are carried out. More importantly, the hazardous waste facilities run on a reliable power supply. This is important because frequent shutdowns and power-ups in hazardous waste burning facilities can cause spurts of highly toxic emissions.

On the one hand, Asian countries are stuck with a historical problem of stockpiles and POPs in use — a problem not entirely of their making. On the other, developed countries partnering with local entrepreneurs are pushing through a major expansion in technologies that could generate POPs.

The theme paper for the June 1996 meeting Intergovernmental Forum for Chemical Safety identifies the problem succinctly:

"There is currently rapid global expansion and use of chlorine-containing plastic materials liable to generate dioxins, furans and other POPs during accidental or uncontrolled combustion. In

addition, few waste incineration facilities exist in the world that employ technology adequate to ensure that these substances are not released . . .Thus, it is expected that the potential for the generation of these POPs from incomplete combustion and waste incineration will increase in the future unless adequate and improved and/or alternative technologies and products become readily available globally."

Unfortunately, many governments in Asia haven't gone beyond denying that POP chemicals cause harm. Chemical companies including some multinational corporations seem to be actively engaged in denying the obvious. The technical manager of Agrevo Private Limited in Pakistan, Liaquat Hayat says "We have never heard of any health hazard caused by the pesticides to the farmers during spray process."

Examples demonstrating the critical situation in Asia abound. A series of investigations by Greenpeace International in Pakistan, Nepal, India, Bangladesh, Thailand, Vietnam and the Philippines in 1998 revealed that:

Manufacturing, trade and usage continues unabated —

- India is among four remaining known manufacturers of DDT (10,000 mT capacity) in the world. The other three are Italy, Mexico and China. Production at Italy's Enichem facility reportedly ceased in mid-1998.
- India exports nearly 800,000 kilograms of POP pesticides, including Aldrin, DDT, BHC, Chlordane and HCH, to a long list of countries, including countries where their usage is banned. Exports of pesticides that could be branded POPs in the near future total more than 2 million tonnes. The latter category of potential POPs or chemicals potentially contaminated with POPs such as dioxins include Endosulfan, sodium Pentachlorophenate, 2,4-D and Lindane. [See Country Report on India]
- Implementation of pesticide regulations is poor, particularly in South Asia. In Pakistan, Nepal and Bangladesh, locally banned or severely restricted pesticides are freely available. DDT, BHC, Dieldrin and Heptachlor are found in vegetable markets in Karachi; BHC and Chlordane, Heptachlor are found in Nepal and India. DDT, BHC and Endosulfan from India, is reportedly available illegally in border markets in Nepal and Bangladesh.
- Smuggling of POP pesticides is widely reported. Pakistan reportedly receives its illegal pesticides (particularly DDT) from China and Iran; Nepal and Bangladesh from India; Thailand and Vietnam from unknown sources.
- Officials in Nepal[1] and Bangladesh[2] confirm that the large unregulated manufacturing and formulating sector in India and the porous land border between India and these countries are the most serious hindrances to efforts aimed at curbing or eliminating the use of POP pesticides.

Obsolete pesticides are stored in more than 1000 stockpiles in Nepal and Pakistan —

- Stocks of 5000 metric tonnes (mT) or more of obsolete pesticides, including POP chemicals, are stored in extremely hazardous conditions in more than a thousand sites in Pakistan and Nepal. A sizable portion of these pesticides are reported to have arrived as part of aid packages from Western countries, and almost all the pesticides were exported by developed nations to Pakistan and Nepal. [See Country Reports on Pakistan and Nepal]
- In the Lao People's Democratic Republic, nearly 20 tonnes of date-expired pesticides, including DDT, BHC, Endrin and Heptachlor are stockpiled.[3] The country has no means to dispose it or adequately contain it until a proper disposal program is identified.

Lack of awareness about handling PCBs in electrical equipment may create a dangerous situation, particularly in South Asia —

- In Thailand, the electricity generating and distributing agencies are stuck with the problem of disposing old PCB-containing transformers and capacitors. Left with no option and strapped for funds, the transformers are stored in unsatisfactory conditions awaiting eventual disposal by incineration in a foreign facility. [See Country Report on Thailand]
- Officials in Bangladesh[4] and Pakistan[5] confirmed that old transformers and capacitors, most of which were imported from North America, Japan and European nations in the 1960s may contain PCBs. However, no inventory exists and no special care is taken to determine the nature of the transformer fluid.
- In India, officials in the Ministry of Environment claim that no significant stockpile of PCBs exist. However, no inventory has yet been done of PCBs in electrical equipment or in the manufacturing sector. More disturbingly, several studies conducted over the years routinely reveal levels of PCB that are indicative of the presence of a PCB source(s) in the country.

Hazardous activities of the past have left behind a legacy of poisons —

- Entire districts in South Vietnam have been converted into reservoirs of life threatening toxin, dioxin, due to war time spraying of dioxin-contaminated Agent Orange by the US armed forces.[See Country Report on Vietnam]
- Sites within erstwhile United States military bases in the Philippines were found to have high levels of PCBs, Chlordane, Aldrin and BHC. In some cases, these poisonous compounds have seeped into the groundwater used by local residents. Evidence of injury among the neighboring communities is mounting. [See Country Report on the Philippines]
- A recently shut down DDT plant in Chittagong, Bangladesh, is in a state of advanced disrepair. The factory complex has open dumpsites storing DDT process waste and is a potential hotspot requiring special handling. [See Country Report on Bangladesh]

Asia is poised for a serious expansion of POPs-producing technologies such as incinerators, PVC manufactories, and pulp and paper mills [See case study on "Emerging POPs Sources in Asia] —

- Over the last three years, India, the Philippines, Thailand and Malaysia have seen a rapid increase in the number of incinerators proposed or installed for burning medical, municipal and hazardous wastes.

- Ironically, bilateral and multilateral aid agencies, including the Asian Development Bank, USAID and DANIDA are promoting POPs-generating technologies such as incinerators and cement-kiln burning as a treatment option for obsolete pesticides stockpiled in various places in Asia.

- New capacity for pulp and paper, and for manufacturing poly vinyl chloride (PVC) is being set up in India, Malaysia and Thailand, even as countries in the North are preparing for an eventual phase-out of PVC. In India, for instance, the PVC industry is set to increase dramatically — from 500,000 tonnes/year to 1.2 million tonnes/year by the end of 1998.6 Chlorinated bleaching of pulp and paper and PVC production are linked to emission of dioxins, furans and other chlorinated compounds, some of which may be persistent organic pollutants.

- The expansion of POPs producing technologies is often supported and, in some instances, pushed by agencies such as Asian Development Bank, the USAID, DANIDA and the World Bank/IFC. [See next chapter]

---

[1] Personal interview with Bharat Prasad Upadhyay, Chief Plant Protection Officer, Plant Protection Division, Kathmandu, Nepal, on 26.04.1998.

[2] Personal interview with Mohd Reazuddin, Deputy Director, Dept of Environment, Ministry of Environment and Forests, Government of Bangladesh, Dhaka, on 05.05.1998.

[3] UNEP (1997) POP Situation in Lao PDR. Country report presented by representative of the Government of Lao PDR, in Proceedings of the Sub-Regional Awareness Raising Workshop on POPs. Bangkok.

[4] Personal interview with Santosh Kumar Das, Chief Engineer, Transmission, Bangladesh Power Development Board, Dhaka, on 08.05.1998.

[5] Personal interview with Asif Khan, Director General, Pakistan Environmental Protection Agency, 20.04.1998, Islamabad, Pakistan.

[6] Edwards, B. (November 1996). The Stranger: The Chlorine Industry in India. Page 9. Greenpeace

EMERGING POPS SOURCES IN ASIA

". . .a liter of ice cream contains 50 times more dioxin than the natural traces detected in Phoenix wastewater."

Prabir Kumar Paul, Managing Director of Phoenix Pulp and Paper Co. in Thailand in response to charges that his company's wastewater contains high levels of dioxins.

A POPs Convention, when concluded, would be meaningless unless phase out programs are matched with adequate resources to assist poor countries in the provision of alternatives for the remaining current uses of POPs (e.g. malaria control), the effective and safe disposal of POPs stockpiles, and the proper detoxification of contaminated sites.

Destruction of POPs stockpiles and remediation of the contaminated sites have important implications for the safety and health of workers, the general public and the environment. Destruction, must be accomplished in a manner that does not further degrade the environment. Organochlorines must not, under any circumstance, be allowed to be dispersed into the environment through direct dumping or the use of dangerous and inadequate disposal technologies such as incineration or cement kiln burning.

Ironically, bilateral and multilateral agencies, including the Asian Development Bank, USAID, and DANIDA are promoting POPs generating technologies such as incinerators and cement kiln burning as a treatment option for obsolete pesticides stockpiled in various places in Asia.

In the long term, the success of any international agreement on POPs will also depend on how strongly it can veer nations away from a development path that presupposes the need for POPs producing technologies and processes. It would be untenable, for instance, to phase-out identified POPs on the one hand even while dirty and discredited POPs-producing technologies are promoted in the developing world.

A global POPs agreement must encourage the transition to clean production on a global scale. Developing countries should be given the opportunity to by-pass dirty technologies and materials, including those which generate unintentional and unwanted POPs as by-products. However, current trends indicate that this is not the case.

As industrialized countries become more successful in addressing POPs sources and phasing-out certain POPs producing technologies, multinational corporations are finding a very convenient and lucrative escape valve for their products and processes by relocating or exporting these to developing countries where the citizens are ill-informed about the dangers of POPs. For the most

part, this has given rise to the unacceptable expansion and greater entrenchment of POPs producing processes and technologies in Asia

Many countries in Asia have no standards for POPs, especially the unintentionally produced ones such as dioxins and furans. And even if such standards exist in some Asian states, they are not matched with adequate monitoring and implementation by relevant government authorities.

Sources of POPs

The major primary sources of dioxins include combustion processes, especially municipal and medical waste incinerators, industrial processes such as chlorine bleaching in the pulp and paper industry, chlorine-using industrial processes including the manufacture of chlorinated pesticides, and the production and disposal of chlorinated plastics such as poly vinyl chloride (PVC).

Dioxin sources such as incinerators and PVC factories are expanding across Asia, even as industrialized countries are beginning to realize the futility of managing dioxins and the absurdity of pegging "safe" or "threshold levels" for a chemical that is known to trigger health effects at very minute levels (i.e. parts per trillion).

INCINERATION

Asia is now under siege from waste management companies from North America, Europe, Australia, and Japan, wanting to peddle discredited incineration technologies to buyers in the region. Over the last three years, India, the Philippines, Thailand, Malaysia, and Vietnam have seen a number of incinerators proposed or installed for the disposal of medical, municipal, and hazardous waste.

Incinerators of all kinds are known to emit dioxins under real-life operating conditions. A number of studies in Europe, USA, Canada, and Asia have demonstrated the presence of dioxins and furans in municipal waste incinerators emissions. PVC incineration is an important source of dioxin formation and has been reported as being the largest source of chloride in hospital waste incinerators. In 1995, the US Environmental Protection Agency (US EPA) listed municipal waste incinerators as the highest source of dioxin emissions into the environment. Medical waste incineration has also been identified by the US EPA as one of the primary sources of dioxin emissions in the United States in 1994.

Dioxins were classified as "known" human carcinogens by the World Health Organization in 1997. The USEPA in its re-assessment of dioxin considered it to be 200,000 times more lethal than DDT.

The key concern among activists who oppose incineration is health. Incinerators release cancer-causing and toxic chemicals from their smoke stacks, including heavy metals (such as arsenic, lead, cadmium, and mercury), PAHs and dioxins and furans. Incineration of municipal, hazardous, and hospital waste is generally considered to be a major source of dioxin emissions into the environment. In some countries, such as the Netherlands and the US, dioxin emissions from incinerators are thought to make up between 80-95% of all atmosphere emissions of dioxins.[1]

Proximity to incinerators burning chlorine-containing material has been linked to increased levels of dioxins in the surrounding environment and nearby populations.[2]

- In the United Kingdom, people who live within 7.5 kilometers of a municipal waste incinerator have an increased likelihood of getting several different cancers, according to a 1996 study of 14 million people living near 72 incinerators in Britain.[3] This study, which is among the first to examine the cancer hazards of solid waste incinerators among the general population —

showed that statistically significant increases were found for all cancers combined (stomach cancer, cancers of the colon and rectum, liver cancer, cancer of the larynx, lung cancer, bladder cancer, and non-Hodgkin's lymphoma) among people living within three kilometers of an incinerator; cancers of the lymph system and leukemia were significantly elevated. While the researchers did not take into account confounding factors such as the effects of poverty, the relationship between incinerators and cancers remained strong, providing real cause for concern among people who live within 7.5 kilometers of a waste burner.

- In France, three solid waste incinerators were closed down in January this year because milk from cows on nearby dairy farms were found contaminated with excessive levels of dioxins. All three incinerators were owned and operated by Generale des Eaux — a company that has proposed a mega-incinerator project in the Philippines. The London-based paper, *The Guardian* also reports that dioxin was found recently in French cheese and butter at levels exceeding safety standards set by the Council of Europe. Waste activists in France are now calling for a moratorium on the construction of new incinerators.

- Dioxins and trash incinerators are now an important public issue in Japan which has some 1850 operating incinerators — the highest in the world. Neighborhoods downwind from incinerators, independent scientists have reported infant deaths 40 to 70 percent higher than average.[4]

- Also, in Japan, where municipal waste contains relatively high levels of the organochlorine plastic, PVC,[5] high dioxin concentrations in soils surrounding a municipal waste incinerator were found to be "well correlated" with high cancer rates among the surrounding population.[6]

- A team of doctors reported elevated levels of these POPs in the breastmilk of women who live downwind from certain incinerators in Germany.

- In Canada, health officials advised against the consumption of wild game taken within a 30-kilometer radius of the Swan Hills PCB incinerator because of the accumulation of dioxins released from that facility.[7]

- Under a program coordinated by FAO, some stockpiles of obsolete pesticides in developing countries are being burned in European incinerators. At one of these incinerators, the Rechem facility in the UK, where PCBs and other wastes are burned, studies have found elevated levels of dioxins in air, soil and foods in the surrounding area. Eggs from ducks and bantam chickens had levels of dioxins that were 4.7 and 20 times higher, respectively, than background levels. Dioxin concentrations in apples grown in the same district as the incinerator carried dioxin levels 2.3 times background. The scientists estimated that, compared with background exposures, people in this district were taking in 2.4 times more dioxin in their milk, 1.3 times more in their potatoes and 3.2 times in soils.[8]

Despite the unfolding tales of contamination and injury due to incinerators coming from countries where regulations are known to be among the most stringent in the world, incinerator capacity in Southern countries is rapidly expanding. Over the past three years, India, the Philippines, Thailand, and Malaysia have seen a rapid increase in the number of incinerators proposed or installed for burning medical, municipal and hazardous wastes.

The Philippines

Greenpeace has uncovered at least ten proposals involving American, European, Australian and Japanese companies, to put up municipal waste incinerators in Metro Manila and other urban

centers in the country. These include proposals for a 1,350 ton per day (tpd) mass burn incinerator in the notorious Manila landfill known as Smokey Mountain, a 2000 tpd facility in Carmona, Cavite, and a mega-incinerator project in San Mateo, Rizal with a daily capacity of 4,500 tons. Because of active community opposition, many of these proposals have been stalled. The mounting public opposition to incineration in the Philippines has in fact prompted legislators to propose the complete banning of incineration as part of the Clean Air bill currently being deliberated in Congress.

However, this has not dampened the enthusiasm of incinerator companies. Some companies even have their Governments lobbying on their behalf. Denmark through its ambassador in the Philippines has lobbied hard in the past for the approval of the mass-burn incinerator in Smokey Mountain to be built by Volund Ecology Systems of Denmark.

Greenpeace has documented at least 25 medical waste incinerators, all potential dioxin factories, all over the Philippines. The Department of Environment and Natural Resources has admitted that it does not have the capacity to monitor for dioxins and other products of incomplete combustion from incinerators. Moreover, hospitals have virtually no segregation to isolate chlorinated waste streams.

Among the waste management and engineering multinationals promoting incineration in the Philippines are:

- Generales des Eaux (France)
- Asea Brown Boveri
- Ogden - Martin (US)
- Volund Ecology Systems (Denmark)

Other lesser known companies include:

- JANCOM (Australia)
- Olivine
- Combulec-Solvatran (Belgium)
- Lohning International (Australia)
- Steinmuller (Germany)
- Goodwood
- Vamed (Austria)
- Scholer

Thailand

Two solid waste incinerators have been proposed to serve the Bangkok Metropolitan Area. The machines, each with a 2000 tons per day capacity, will be located in the garbage sites of Onnuj and Ram Intra. The first bids for these projects were won by CEC-Uhde Joint venture and Siam Gas, both of which are proposing to build waste to energy units. However, allegations of irregular transactions had reportedly stalled the bidding process.

According to Veera Mavichuk, deputy director, Department of Industrial Works, two more incinerators with 1000 tons per day capacity are under bidding (July 1998). These incinerators are set to come up in Bang Phu and Bang Phak Phong.

Thailand, which lacks legislation relating to dioxins, seems to have embraced incinerators nevertheless. Two hospital waste incinerators (20 tons per day each) operated by the Bangkok Metropolitan Authority deals with the waste coming from 312 hospitals and medical clinics in Bangkok. According to a local journalist, both incinerators use Australian technology. Operators at the facilities admit to burning plastic, bottles, and sharps together with infectious waste in these facilities. On a visit to one of these incinerators in July 1997, Greenpeace activists witnessed thick black smoke being emitted from the smokestack of the batch-fed incinerator.

The Ministry of Health has reportedly allocated budgets to individual municipalities to build their own incinerators using technology that has been developed by the Department of Civil Works.

Thailand has also been the recipient of these toxic Trojan horses from "generous" companies and governments. In December 1994, the Bangkok Metropolitan Authority received a 6M baht mobile incinerator for infectious waste from the Kyowa Kako Co.

Incinerator companies don't seem to have spared the royalty either. A few years ago, the King of Thailand was gifted by the President of Finland with an incinerator to dispose of the Royal Palace's garbage. The incinerator uses Finnish equipment and technology from IVIO and ECOTEC.

In the resort-island of Phuket, a 250 tpd garbage incinerator using technology and erection assistance from Germany-based Martin and MC Incineration Co (a Mitsubishi Heavy Industries affiliate) respectively, is currently operational. Ironically, the incinerator is touted as an environmental confidence-building measure meant to enhance Phuket's stature as a tourist destination. In fact, officials are considering the construction of a second incinerator with the same capacity as the first, although Phuket generates a meagre 180 tons of waste per day.

In the Northern Region Industrial Estate (NRIE), another incinerator costing 8M baht is also being considered by authorities to deal with garbage generated by the more than 60 factories within the estate.[9] The estate, according to reports, already operates two smaller incinerators.

Other incinerator proposals have met with community opposition, such as the Provincial Electricity Authority's 300 tpd waste-to-energy burner (fueled by garbage and lignite) in Chiang Mai. The project is in partnership with Kvaerner EnviroPower AB of Sweden. The Swedish company is also proposing to use the ash derived from combustion as construction material for bricks and ingredient for fertilizer production. Because of strong local opposition, the PEA plans to relocate the project to Udon Thani.

Another controversy involves plans to build a hazardous waste treatment facility, including an incinerator, in Rayong, a province at the entrance to Southern Thailand. The waste treatment complex uses technology supplied by US-based Waste Management Inc., which has violated US environmental laws on several occassions. The project, known as GENCO and jointly promoted by Thai government agencies, has sparked tremendous community opposition in Rayong due to fears that toxic waste processed in the facility might leak into the nearby Nong Plalai reservoir.

Following the opposition, the Ministry of Industry has agreed to shift the pollution including the treatment facility and the incinerator to Map Tha Phut Industrial area.

Thailand's national hazardous waste management strategy calls for the construction of a 15,000 tonnes per year incinerator for hazardous waste in Ratchaburi, site of a toxic waste treatment center — and other hazardous waste incinerators in Chonburi and Saraburi. The Chonburi and Saraburi incinerators are expected to handle 15,000 tons each of hazardous waste per year.

India

India's experience with incinerators began in the 1980s when Denmark "donated" a 300 tons per day incinerator to burn Delhi's garbage. Fortunately, Indian garbage was too wet and the incinerator stopped functioning shortly after coming on stream.

In 1996, the Supreme Court ruled that every hospital in Delhi with more than 50 beds ought to install an incinerator to destroy its waste. This order was revoked after an environmental NGO intervened in the case to explain the hazards of incinerator. However, incinerator manufacturers took the cue and began marketing their products all over the country. According to P. Bineesha of Tata Energy Research Institute in Bangalore, the number of incinerator manufacturers with a presence in the South Indian city increased from three to more than 20 within a year.

In the meantime, a public information and lobbying campaign launched by Delhi-based NGO Srishti and Toxics Link (with presence in Delhi and Mumbai) resulted in the notification of the Biomedical Waste (Management & Handling) Rules, 1998. The rules laid down guidelines for segregation of medical waste and identified recommended treatment/disposal options and laid down standards for these options. They also restricted the usage of incinerators for pathological waste, and banned the introduction of any chlorinated plastic into the incinerator.

While the Rules were a definite legislative victory, they mean little in a context where enforcement is lax. Moreover, India has neither set emission norms for dioxins, nor does it have the capacity to monitor for it.

In the absence of any set guidelines on emission norms for POP chemicals, incinerator manufacturers are preparing to sell machines costing anywhere from Rs. 50,000 to Rs. 15,00,000 to hospitals. In the process, many of them even promise that their machines will meet EU standards.

International agencies are also in the fray for good measure. In 1997, the US Asia Environmental Partnership — a US government agency aimed at promoting US trade in environmental products and services — hosted a seminar on medical waste in Mumbai, which included a presentation by the US-based incinerator promoter Doucet & Mainka. The spokesperson for the company, Mr. Kasinathan Rangaswamy, later said that the USEPA limits on dioxins was too stringent for developing countries, and that developing countries should make do with "50 to 60 percent" of the prescribed levels.

Malaysia

The Malaysian Ministry of Health has approved the construction of large regional medical waste incinerators and smaller on-site hospital waste burners throughout Malaysia as part of its national clinical waste management system. Incineration plant contracts have already been awarded to Faber-Mediserve Sdn. Bhd. to cover the northern region of Malaysia, Sabah and Sarawak; Radicare Sdn. Bhd. for the central and eastern regions; and Tongkah Medivest Sdn. for the southern region.[10]

More recently, Union Carbide, known better for the Bhopal gas disaster, has announced a joint venture with Petronas (Malaysian Petroleum industry) to set up an Olefins and Derivatives Plant for the production of ethylene, propylene and derivatives products — mainly ethylene oxide, ethylene glycol, butano, amines, ethoxylates, glycol ethers and butyl acetate. The project will include an onsite incinerator.

The plant is sited at a designated area for heavy industries within the Kerteh Industrial Zone in the State of Terengganu. The nearest residential area is 2km away.

Vietnam

According to the National Steering Committee for Water Supply and Sanitation, the government is likely to embark on a pilot incinerator project to deal with liquid and solid waste coming from ten hospitals. The Vietnamese government has already shortlisted the following companies: Redfox Company (US); Sweden Trimar Steering Group; Japan Inciner Group; and China Jinsin Trade Company.[11]

The Vietnamese government's decision to adopt incineration is reinforced by recommendations from an Asian Development Bank (ADB) funded study on Hazardous Waste Management for the National Environment Agency which prescribes "regional incineration in centralized, strategic facilities with adequate air pollution controls" as part of the recommended strategy for hospital wastes.[12] It should be noted that the same study also considers the development of high technology hazardous waste incinerators as inappropriate for Vietnam's current stage of development — but foresees the need for it by the year 2009.

In the problem of medical waste disposal, governments in the region are also taking their cue from the World Health Organization which unfortunately still sees a role for incineration in the disposal of infectious waste.

Despite the abundance of evidence pointing to extreme hazards associated with medical waste incineration, and the availability of safer and cheaper alternatives, there are no indications that the WHO has abandoned this stance. In a WHO workshop on Clinical Waste Management held in Kuala Lumpur, Malaysia in November/December 1994 for the Western Pacific Region, a WHO consultant presented guidelines for the incineration of clinical waste stressing the advantages of incineration over other treatment methods such as autoclaving and microwaving, in the matter of waste volume reduction, for instance.[14]

The WHO prescription for developing countries to continue incinerating infectious waste is untenable, given that monitoring capacity especially for dioxins and furans is absent in many of these countries. More importantly, cheaper and less complicated methods exist and are employed to deal with medical wastes.

In effect, the WHO must reconsider its current position that seems to sanction the release of life-threatening POPs into the environment via incineration which is inappropriate especially for a UN agency actively involved in the global program to phase-out POPs from the planet.

CHLORINE BLEACHING IN THE PULP AND PAPER INDUSTRY

Large amounts of chlorine or chlorine compounds are used in the pulp and paper industry for bleaching the pulp. Because chlorine is extremely reactive, it combines with the organic matter in the pulp to produce thousands of new chemicals, mostly organochlorines. Chlorine is used in a number of different forms as elemental chlorine gas, chlorine dioxide, or sodium hypochlorite. All result in the discharge of toxic organochlorine by-products.

Over 300 organochlorines — including dioxins, furans, chlorinated phenols, acids, benzenes, and many others[15] — have been identified in the discharges of bleached pulp mills. These identified compounds account for less than 10 percent of all the organochlorines in the effluent; the majority remain "mystery chemicals that have not been specifically identified or assessed.

Predator fish and other species near pulp mills have been found to accumulate dioxins and other organochlorines at concentrations thousands or even millions of times greater than the levels

found in the water itself.[16] Dioxin contamination has forced the closure of fishing grounds around eleven of the fourteen pulp plants on the British Columbian coast in Canada, where extremely high dioxin concentrations were found in crabs , mussels and the liver tissue of fish.[17]

Organochlorines can also be found in the paper products themselves. Canadian environmental authorities for example estimate that 2 percent of the organochlorines formed in the bleaching process remain in the pulp.[18] Dioxins and furans have been identified in cigarette paper, tampons, diapers, tissues, coffee filters, and bleached milk cartons.[19] Bleached containers and filters can leach dioxins into milk, coffee, and other foods with which they come in contact.[20]

Indeed, there is extensive evidence that effluent from chlorine-bleaching pulp mills harms fish and aquatic ecosystems. Pulp mill discharges — and organochlorines in particular — have been linked to physical deformities in fish, reduced gonad growth, hormonal changes and reproductive impairment, liver disorders, disruption of cell function, changes in blood composition, damage to skin and gills, changes in shoaling behavior, and changes in the structure of fish populations. An extensive study by the Swedish EPA was unable to determine any safe exposure level to organochlorine discharges from pulp mills, concluding that "regional and possibly large-scale" damage to fish and the aquatic foodchain may be occurring throughout the Baltic ecosystem.[21]

Pulp can now be bleached using totally-chlorine free (TCF) methods. Since the 1970s, many of the world's major paper companies have developed chlorine free bleaching processes that use oxygen-based bleaches, including ozone, hydrogen peroxide, and oxygen gas. TCF bleaching is now effective, feasible and economical. Investment and operating costs in a new TCF pulp mill are lower than those of a mill based on chlorine dioxide bleaching and external active-sludge waste treatment.[22]

Companies who have shifted to Elemental Chlorine Free (ECF) technologies, while not using chlorine gas in their bleaching operations, could not claim to be chlorine free — as they are using chlorine dioxide which still results in the production and release of large quantities of organochlorines, though less than chlorine gas. An average-sized pulp mill discharges around 35 tonnes of organochlorines every day, while those using chlorine dioxide discharge 7 to 10 tonnes per day.[23]

Technologies now exist for pulp mills to not only eliminate chlorine but become Totally Effluent Free (TEF). By treating and recycling effluent within the process system, it is possible to reduce the use of water and stop toxic discharges. Estimates show that a closed-cycle mill would cost less than a chlorine bleaching mill to construct and operate.

In Asia, some of the larger and faster growing economies have seen a rapid increase in pulp and paper production during the past decade. This came about as new world-scale mills in the region have come on stream, and many mills have modernized their operations to meet increasing demand for paper and paper products all over the world.

China's pulp and paper production is the highest in the region in terms of output, considering the fact that it has over 9,000 pulp and paper mills, far more than any country in the world. Many of China's mills though are small and antiquated by world standards. As a major paper exporter, Indonesia has also rapidly expanded its pulp and paper industry, and now produces more paper and board than India. Malaysia, Thailand, the Philippines and Vietnam are also planning to expand their pulp and paper industry.

In Thailand, for example, demand has been growing steadily. According to the Thai Pulp and

Paper Industries Association domestic consumption is expected to increase by 12 % annually between 1994 and 1998. It was projected (before the economic crunch) that Thailand would increase its pulp mill capacity from the present four mills producing about 200,000 tonnes/year to 14 mills that would produce 930,000 tonnes/year.

Paper mills will also increase from the present 43 mills producing 1,842,000 tons/year to 54 mills with a total capacity of 2,895,000 tons/year.[24]

The pulp and paper industry has too often been pinpointed as a leading source of environmental pollution in Asia. In China, pulp mills are considered to be the largest source of industrial wastewater.[25] The operation of mills in India, Indonesia, the Philippines and Thailand have also been associated with severe episodes of water pollution involving failure to control toxic spills and discharges, and lack of wastewater treatment facilities among others.

In May 1992, villagers protested that the Phoenix Pulp and Paper Company in Khon Kaen , Thailand was releasing waste water into the Nam Pong River, an important water source for Thailand's northeast region. Villagers also reported fish kills due to the effluent. Authorities and protesters accused Phoenix of releasing dioxins as a consequence of its pulp bleaching operations using chlorine. Subsequently, the government shut down the mill twice during 1992 -1993 ordering an overhaul of the mill's wastewater treatment system. The company has never admitted responsibility for its waste water polluting the river and causing fish kills.

In 1994, company started its second production line using the ECF bleaching sequence. In the same year, it also initiated an experimental project called "Project Green" which involved diverting about 60 percent of the plant's treated waste water to irrigate about 500 hectares of surrounding lands of eucalyptus plantations.

However, farmers in the surrounding area are protesting that Phoenix's waste water is now contaminating their drinking water sources and killing rice crops.[26]

In India, Greenpeace investigations and sampling reveal that rayon grade pulping operations by Tamilnadu-based SIV Industries and Seshasayee Paper and Board mills, Gujarat-based Central Pulp Mills, and Ballarpur Pulp mill in Haryana are all discharging a complex range of highly dangerous organochlorines. Some of these compounds are used as indicators of the presence of dioxins. Like Phoenix in Thailand, some of these mills, such as SIV Industries, are diverting their water to irrigate farmlands.[27] However, relations with the local farmers are very strained and often take a violent turn.

Most of the small and medium-sized Asian mills employ outdated technology and equipment, resulting not only in inefficient industry practices, but greater pollution. There is also widespread use of hypochlorite bleaching and other conventional bleaching processes involving chlorine. However, because of the weak monitoring and enforcement regimes in the region, organochlorine pollution has never really received the attention it truly deserves among the many environmental abuses associated with pulp and paper production.

Indian pollution control authorities, for example, readily admit that they do not have facilities to test for organochlorines. For the most part in many Asian countries, there are no specific regulations for the pulp and paper industry. The widespread use of conventional chlorine bleaching processes and the lack of adequate waste water treatment facilities coupled with weak monitoring and enforcement regimes in the region make this sector a potential top source of POPs pollution in Asia.

PVC EXPANSION IN ASIA

PVC (polyvinyl chloride) production facilities are referred to as "dioxin factories" by environmental campaigners for good reasons. PVC poses the threat of releasing dioxins and furans at every stage of its life cycle — production; accidental combustion during storage or usage; disposal by combustion techniques.

Also known as vinyl, PVC is widely used in packaging, toys, furniture, pipes, flooring, window frames, credit cards, venetian blinds and other products. The burning of PVC products either in incinerators or accidental fires gives rise to large amounts of dioxins and other toxic emissions. Several studies have found a direct relationship between the amount of PVC in waste fed into an incinerator and the amount of dioxin emitted. Accidental fires at PVC factories and in offices and homes have also been found to result in high dioxin releases to the environment.

A series of European studies have clearly established that large quantities of dioxin are formed in the production of vinyl chloride monomer (VCM), the building block for PVC. Studies have found very high levels of dioxins in the environment associated with the production of PVC. In May 1994, the Swedish Environmental Protection Agency found that PVC itself contains measurable quantities of dioxins and furans.

Recent analyses commissioned by Greenpeace on effluents from a PVC plant and on residues from PVC manufacture have confirmed that this industrial sector may be an important contributor of certain dioxin congeners.[28] Another report also shows high concentrations of dioxin in the waste stream of PVC facilities in the Gulf States of the USA.[29] In Italy recently, authorities have stopped discharges from a PVC plant, after Greenpeace found and reported high levels of dioxins in sediments and shell fish caught in the Venice lagoon.

While these incidents of dioxin pollution as a consequence of PVC production are taking place in countries with very strict monitoring standards, the PVC industry from the industrialized world is setting its sights on Asia for future rapid expansion. As things stand, the PVC industry in Asia is already well entrenched, but due to projections that Asia will be the biggest consumer of PVC in the next century despite difficult short-term outlook brought about by Asia's current economic crisis, Western petrochemical giants, sometimes aided by international financing institutions, are now integrating with local Asian players in the hope of getting a share of the burgeoning Asian market.

Consider the following developments:

- In India, expansion of the PVC industry is set to increase dramatically from 500,000 TPA to 1.2 M TPA by the end of 1998. Much of this PVC expansion is accounted for by Reliance Industries which hopes to be a major global player in PVC;
- Thyssen Polymer, the world's third largest window and door frame producer, has entered into a joint venture with the Gaysorn group to form Polymer Solution Co. in Thailand. The intention is to make Thailand a regional production base and marketing center for the emerging Asia Pacific market. The Thai fabrication facility that will be set up would initially assemble 100 units/day of PVC windows. The company is also considering four facilities in Bangkok for the assembly and distribution of products. In 2001, the company plans to set-up an extrusion plant in Bang Chan (1,500 tonnes a year) which will increase to a full capacity of 2,500 tonnes/year. Main export markets are SEA, Japan, Taiwan, HK and China.
- The Indonesian government has received a loan from the Asian Development Bank that would facilitate the supply and delivery of PVC pipes, fittings, accessories and miscellaneous materials under its Eastern Island Urban development Project;

- Other Transnational Corporations like Norsk-Hydro of Norway are looking at Asia for their various petrochemical ventures (including chlor-alkali and VCM-PVC capacity). Norsk-Hydro has recently entered a joint venture with France's Elf Atochem to form Qatar Vinyl. The joint venture is envisioned to supply the markets for EDC (ethylene dichloride) and VCM (vinyl chloride monomer) which are the main building blocks for PVC, in Asia. The Qatari complex is expected to start production in 2000 and is expected to produce 338,000 tonne/year of EDC, 200,000 tonnes/year of VCM. The output from the complex which includes surplus EDC is destined primarily for Far East markets.
- Norsk Hydro currently ships VCM to the region and also has a 60 percent share in Singapore Polymer's PVC production which operates a 25,000 tonne/year suspension PVC plant and a 50,000 tonne per year compounding unit. It has also set up a joint venture with the Singaporean government's investment arm, Temasek, to invest in petrochemicals which would likely focus on PVC and PVC-related compounds.[30]
- In China, the Norwegian giant is involved in a joint venture with US-based Westlake to produce 100,000 tonne per year PVC resin project at Suzhou, Jiangsi Province.
- It is also in talks with India's Tamil Nadu Industrial Development Corporation (TIDCO) for a proposed 150,000 tonne/year PVC facility, and has partnerships with Chennai-based S&S Industries for PVC products.
- The International Finance Corporation, the corporate lending component of the World Bank complex, is planning to bankroll a project to build a 100,000 ton per annum PVC manufacturing plant in Malaysia. The project involves Norsk-Hydro (Hydro Asia) and the American petrochemical group Westlake -- both of which have entered into an agreement with the Malaysian group Titan. The project will be located at the Tanjung Langsat Industrial Estate close to Johor Baru, Malaysia.
- EVC International another global giant in PVC, has licensed its technology for PVC to Thai Plastic and Chemicals Public Co., the first PVC resin/compound producer in Thailand. The latter will use the technology to expand its PVC plants in Map Ta Phut Industrial Estate, about 100 miles southeast of Bangkok. The expansion of the plant, scheduled for completion in 1999 will boost annual PVC resin capacity from the current 748 million pounds (339,590 tons) to 1.01 billion pounds (459,000 tons).
- EVC has sold 47 technology licenses covering the ethylene dichloride/vinyl chloride-PVC chain since 1990; this year will see the start-up of five ethylene dichloride/vinyl plants in China, Saudi Arabia, India, and three PVC plants in China, Taiwan, and Australia using EVC licenses.
- Tosoh Corporation of Japan has entered into a joint venture with the Philippines' largest PVC producer, Mabuhay Vinyl, and Mitsubishi Corporation to set up Philippine Resins Industries. The project will set up a PVC plant in the Bataan peninsula with an initial capacity of 70,000 tonnes per year. Tosoh also has PVC production projects in Indonesia and Malaysia.
- Malaysian petrochemical giant, Petronas is also involved with Marubeni for a joint venture project in to produce 100,000 tonnes /year of PVC in ba Ria-Vung Tau , Vietnam. This project is a joint venture with Petro Vietnam.

As PVC expansion intensifies in Asia, an impending waste disaster is not too far behind. Given the escalating volume of PVC products being consumed and consequently discarded by society — Asia will soon find itself drowning in a mountain of PVC waste that by all indications will only end up in landfills, incinerators and polluting "recycling" operations.

Moreover, some Asian countries like the Philippines, Indonesia, China and Pakistan are absorbing the environmental liabilities brought about by PVC production and usage in Europe and North America. PVC waste and scrap are sent by consumer countries such as the Netherlands, Germany and US to "recycling" operations in the South. Greenpeace investigations of such recycling operations in Asia, however, prove otherwise.[31]

SHIPBREAKING

A long overlooked sector in terms of its polluting nature and risks to workers, shipbreaking has emerged to become one of the more shocking industries that demonstrate a clear shift of pollution-intensive industries from the North to the South. Ships, particularly those built in between 1940-1990 are, perhaps, the most hazardous genre of ships. The chemicals invented for destructive purposes during the World War II were rapidly adopted for peacetime applications and found uses in the manufacture of paints, insulants, plasticisers, flame retardants and anti-foulants.

Until late 1970s, ships were broken in the country of its last owner. In some cases, they were dismantled at the yard of the shipbuilders who constructed them. US ships were broken in the US; German ships in Germany. But as the body of environmental and worker safety legislation grew and their implementation became more stringent in developed countries, pollution-intensive industries began to be regulated out of these countries. The shipbreaking industry moved to Portugal and Spain and other Southern European countries, and eventually to Asia.

Today, the Alang-Sosya Shipbreaking Yard in Gujarat, India, is the largest of its kind in the world. Upto 360 large ships are broken every year at these yards. Other smaller yards operate in Gaddhani, near Karachi in Pakistan; Chittagong in Bangladesh; Cebu, the Philippines; Mumbai (Bombay), India, and in Vietnam.

The POP connection

The two POP chemicals of concern in shipbreaking are dioxins/furans and poly chlorinated biphenyls (PCBs). PCBs were used extensively as an insulant in transformers and capacitors or as flame retardants in plastics and transmission fluids. While PCBs are not of significant concern in passenger and cargo ships, naval vessels are notorious for carrying PCB oil on board.

In Alang and Mumbai, India and Chittagong, Bangladesh, visiting Greenpeace activists found that virtually no environmental precautions were taken by the breakers. Waste oil was casually spilled on the beach.

Although we did not witness any naval vessels being broken, we are told that all oils extracted from the ships are sold inland to steel rolling mills who use the oil as a fuel supplement in their furnaces. Oil sludge is simply wiped off onto the beach to be washed away by the tide. Given that it is not unlikely to find PCB oil on naval ships, it wouldn't be inaccurate to say that the PCB oils are both burnt and spilled into the environment. In any event, neither India nor Bangladesh have any protocol for handling PCB wastes.

The Japanese government subsidises the dismantling of some of its ships in Cebu, the Philippines. Attempts by community activists and other Filipino to access the shipbreaking yards were futile. However, samples of mud taken from the vicinity of the shipbreaking yard revealed significant levels of PCBs and an organotin. The sampling, which was done by Cebu Tsuneishi Concern Japan Action Network, found between 0.07 and 0.16 parts per million of PCB in sediment samples taken from near the yard.[32]

E-15[illegible]
COMMUNITY HEALTH CELL
LIBRARY AND DOCUMENTATION UNIT

Studies also indicate that POPs such as dioxins and furans may be released during shipbreaking. The steel structure of the ships were stripped apart by young men armed with nothing more than a cutting torch. A 1998 study done in Germany reports that: "Exposures in excess of the German threshold limit value [of 50 picograms . . . per cubic meter] are very frequent, unpredictable, and sometimes very high — up to 6612 pg/cubic meter — during thermal oxygen cutting at scrap metal and demolition sites."[33]

Also, preliminary analyses results of a sampling and documentation exercise conducted by Greenpeace in Mumbai and Alang shipbreaking yards provide us with evidence of severe contamination of both sites.

- Soil samples taken from the Mumbai shipbreaking yard contained high levels of dioxins.
- The Alang yard is seriously contaminated with heavy metals and high levels of tributyl tin were in evidence at the plot where ships were being broken. Tributyl tin is highly toxic to aquatic fauna.
- Detectable levels of PCB (polychlorinated biphenyls) were found in cable coatings taken from a German ship that was being broken in Alang in October 1998.

Another chemical category of concern is the polynuclear aromatic hydrocarbons (PAHs), which may also be released during metal cutting operations involving high temperature torches. PAHs are not classifed as a POP by the UNEP, but are considered a POP by the UN ECE agreement on Long Range Transboundary Atmospheric Pollutants.

Northern country governments are aware of the various problems involved in shipbreaking. Given this, the trade in ships laden with hazardous substances is nothing but the wholescale export of environmental and worker safety liability to developing countries.

Greenpeace demands that the ships ought to be decontaminated at the owner's country at the owner's cost before they are exported to Asia for breaking. In Asia, the decontaminated ships need to be broken after ensuring that all efforts are taken to protect the environment and safeguard workers' health and lives.

---

[1] Djien A.K. and van Zorge A.J. (1995) Dioxin and related compounds: Status and Regulatory Aspects. Environ. Sci. and Polut. Res.., 2(1) :46-56.

[2] Several items in the below list were taken from Costner P., Luscombe D., Simpson M. (October 1998). Technical Criteria for the Destruction of Stockpiled Persistent Organic Pollutants.

[3] Eliott. "Cancer incidence near municipal solid waste incinerators in Great Britain" — British Journal of Cancer vol 73, 1996 pp 702-710

[4] *The New York Times,* April 27, 1997.

[5] Muto H., Saito K., Shinada M., Takizawa Y. (1991). Concentrations of Polychlorinated dibenzo-p-dioxins and dibenzofurans from chemical manufacturers and waste disposal facilities. Environ. Research 54: 170-182

[6] Ohta S., Kuriyama S., Nakao T., Aozasa O., Miyata H., Tanahashi M. (1997). Levels of PCDDs, PCDFs and non-ortho coplanar PCBs in soil collected from high cancer-causing area close to batch-type municipal solid waste incinerator in Japan. Organohalogen Cpds 32: 155-160.

[7] Alberta Health (1996). News Release: Wild Game Public Health Advisory, Edmonton, Alberta. December 13, 1996.

[8] Foxall C., Lovett A., Creaser C., Ball J. (1997). Environmental levels of PCDD/Fs and PCBs in Panteg

District of South Wales, UK and their implications for human exposure. Organohalogen Cmpds 31:342-342-347

[9] "Waste Incinerator soon to be built at NRIE, says director," Bangkok Post, 9 Jan 1996.

[10] "Malaysian National Clinical Waste Network" Hazwaste No. 110, May 1997, p. 16.

[11] Letter from Prof. Pham Song, Vice-Chair of the National Steering Committee for Water Supply and Environmental Sanitation, dated Augsut 25, 1998.

[12] Viet Nam National Strategy for Hazardous Waste Management (Final Report); Asian Development Bank TA: 2704-VIE, July 1998.

[13] Management of waste from hospitals and other health care establishments; Report on a WHO meeting - Bergen, 28 june-1 July 1983; Euro Reports and Studies 97, WHO Regional Office for Europe, Copenhagen.

[14] Workshop on Clinical Waste Management (Report: RS/94/GE/32MAA), Kuala Lumpur, Malaysia 28 November - 2 December 1994, WHO, Western Pacific Regional Environmental Health Center (EHC)

[15] Bonsor, N.. et al. (1989) Kraft Mill Effluents in Ontario: Report of the MISA Study. Windsor: Environment Ontario. See also, Suntio, L. Shiu. W., and mackay, D. (1988). A review of the nature and properties of chemicals present in pulp mill effluent. Chemosphere 17(70: 1249-1290.

[16] Environment Canada (1991). Canadian Environmental Protection Act: Priority Substances List Assessment Report No. 2: Effluents from Pulp Mills using Bleaching: Ottawa: Government of Canada.

[17] Greenpeace Germany. (1992) Das Plagiat.

[18] Bonsor, N. et. al (1989)

[19] Rappe, C. (1990) Environmentally stable chlorinated contaminants from the pulp and paper industry. In Vaino, H., et al Complex Mixtures and Cancer Risk. International Agency for Research on Cancer, p. 341-353.

[20] Furst, P. , et al (1991) . Body burden with PCDD and PCDF from food . Biological Basis for Risk Assessment of Dioxins and Related Compounds. Banbury Report 35: 133-142.

[21] Sodergren, A. et al (1993). Bleached pulp mill effluents: Composition Fate, and Effects in the Baltic Sea. Report of the Environment/Cellulose II Project. Swedish Environmental Protection Agency #4047. See also Sodergren, A. et al (1989). Biological Effects of Bleached Pulp Effluent. Swedish Environmental Protection Agency, # 3558.

[22] M. Ward (1994). Eka Nobel develops closed-loop bleaching method. Chemical Week, 16 March 1994, p.16.

[23] Salomon, K., et al. (1993) A Review and Assessment of the Ecological Risks Asspciatted with the Use of Chlorine Dioxide for the Bleaching of Pulp. Alliance for Environmental Technology, October 1993. Assuming a minimum production of 0.7 kg AOX per ton of pulp, 2 kg. of organochlorines for each kg AOX, and world bleached pulp production of about 100 million tonnes per year.

[24] The Nation, 13 July 1995.

[25] Network for Industrial Environmental Management (NIEM) Regulatory Options Seminar, Final Report, 15-17 November 1995.

[26] Rajesh, N., Thailand Country Report on Pollution, ASEAN Environment Programme , WWF- Malaysia, (December 1995).

[27] Edwards, Bob., The Stranger, Greenpeace International (November 1996).

[28] Achieving Zero Dioxin, Greenpeace International , (Decmeber 1994).

[29] Costner, P. PVC: A Primary Contributor to the US Dioxin Burden., Greenpeace International (1995).

[30] European Chemical News — (20-26 January 1997).

[31] Greenpeace Netherlands (Jan 1998). Export of Dutch Waste PVC to Asian Countries, Final Report.

[32] Newsletter No.14 \ Mar.1997. Japan Cccupational Safety and Health Resource Center.

[33] Menzel H.M., Bolm-Audorff U., Turcer E., Bienfait H.G., Albracht G., Walter D., Emmel C., Knecht U., Papke O. (April 1998). Occupational Exposure to Dioxins by Thermal Oxygen Cutting, Welding, and Soldering of Metals. Environmental Health Perspectives. Vol 106, Supplement 2, pp:715-722. April 1998.

COUNTRY REPORT — BANGLADESH

Bangladesh' POPs sector is largely import dependent. Pesticides are supplied primarily by Indian and northern multinational manufacturers. Like in Nepal, the success of Bangladesh' pest management program depends largely on the quality and implementation of Indian regulations.

Take for instance the organochlorine pesticide Endosulfan. The pesticide is particularly toxic to fish and other aquatic fauna, and ought not to be used near surface water sources. In Bangladesh, its use is restricted to upland tea plantations. The Plant Protection Wing of the Ministry of Agriculture expressly discourages its application in lowland farms because of its potential effects on the rich fish population in the unique patchwork of water bodies, rivers and estuaries crisscrossing Bangladesh. However, Endosulfan is a popularly available pesticide in India. Reports from the Bangladesh-India border speak of the rampant smuggling of sub-standard, illegal and inappropriate pesticides, including Endosulfan and BHC, from India to Bangladesh.[1]

Stockpiles:

Figures of the total quantity of obsolete pesticides in Bangladesh varies between 300 and 900 tons. If the stockpiles really exist, the contents are most likely DDT intended for vector control. The health department in Agrabad, Chittagong, reportedly stores 500 tons.

Greenpeace was able to confirm the existence of nearly 15 tons of old DDT at the now-closed DDT factory in the Chittagong Chemical Complex. At the time of the visit, the CCC official claimed that the 15 tons were slotted to be removed for use by the Department of Health in July 1998.

PCBs

In a country, where awareness even of pesticides such as DDT and chlordane has been slow to spread, regulation on dioxins, PCBs and furans will be long in coming.

Take the case of PCBs in electrical equipment. The technology and equipment for Bangladesh' electrification drive is totally dependent on northern countries and India. As a result, at least some of the 57 grid substation and substation transformers imported in the past may contain PCB as insulant.

Fortunately, the number of transformers and the quantity of PCBs may not be too high in Bangladesh. This must be seen together with the fact that no awareness exists of the dangers of PCBs and the possibility that some transformers may contain this toxic substance.

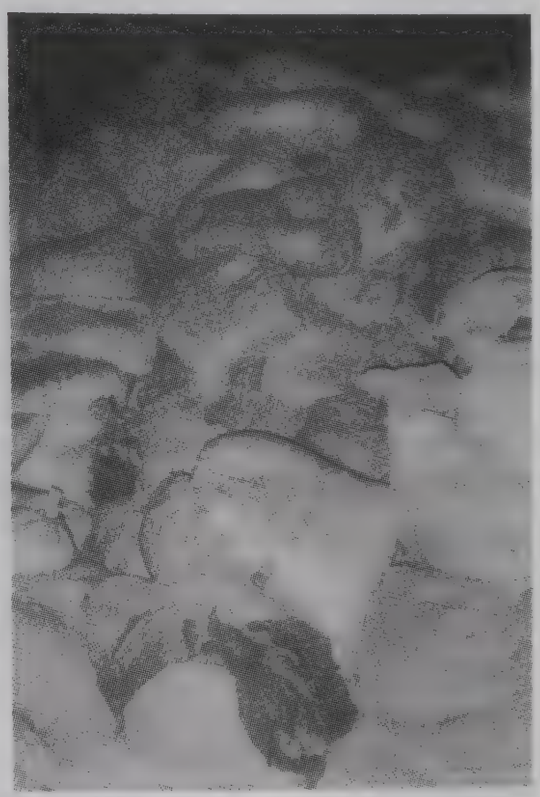
Senior officials in the Bangladesh Power Development Board (BPDB) admit that they are unaware of the nature of the insulant used in electrical transformers and capacitors. "Is it toxic? Our

workers routinely handle it and some even apply it on their joints to treat gout," said an alarmed Santosh Kumar Dash, chief engineer-transmission at the BPDB. One can only hope that this is non-PCB oil.

MAIN FINDING

Chittagong DDT Plant: A Potential Hotspot

A shut-down DDT plant in Chittagong, which is now ready for scrapping, could pose a serious risk to environment and worker health if scrapped and disposed improperly. The factory and the site visited by Greenpeace in May 1998 appears to be a potential hotspot.



The plant and the machinery — installed in 1966 — are in an advanced state of disrepair. An open sludge heap near the plant was identified by a plant supervisor as process waste from the DDT plant. "This is not waste; DDT can still be recovered from this sludge," he said.[2]

A warehouse adjacent to the factory used to contain 224 tons of leftover DDT after the plant was shut down in 1991. However, a bulk of the stocks has disappeared. "As recently as January 1997, DDT was available in the market; the traders said they got it from the Chittagong Chemical Complex," says Sahidullah Lipon, a journalist and lecturer at the Chittagong University. "Some people attacked the CCC with the assistance of the CCC and stole some DDT during the [1994] plague outbreak in India," he recalls.[3]

The contents of the DDT warehouse have reduced in quantity considerably. About 15 tons were stored in jute sacks at the time Greenpeace's visit. The condition of storage at the warehouse is abysmal. About an inch-thick carpet of DDT lines the floor. With every step, a fine dust of DDT is released. Workers employed in transporting the DDT sacks are bound to be severely exposed to DDT dust. It is also quite likely that the warehouse, the plant and the sludge dump nearby act as a point source for DDT contamination in the region.

The factory premises need to be treated as a potential "severely contaminated" site and the factory machinery must be dismantled, processed and disposed as toxic and hazardous wastes.

---

[1] Gain P. State of Pesticide Business and Use in Bangladesh. Society for Environment and Human Development (SEHD), Dhaka, February 1993

[2] Conversation with plant supervisor, 6 May, 1998, at Chittagong Chemical Complex.

[3] Interview with Sahidullah Lipon, lecturer, Chittagong University, 6 May, 1998.

COUNTRY REPORT: INDIA

Owing to the sheer size of its manufacturing industry, India is and should be a major player in the international negotiations to eliminate POPs. On the one hand, the Indian chemical industry, which manufactures many of the POPs chemicals which are no longer produced by their developed country country counterparts, may be forced to spend money on finding new products and markets. On the other, the government is faced with a situation where continuing POPs production would severely aggravate the already monumental problem of toxics pollution and widespread water contamination.

Pesticides

In India, both the pesticides industry and its associated problems have grown rapidly since 1948 when, for the first time, DDT was imported for malaria control. Chemical pesticide usage in agriculture began in 1949. In 1954, the first factory for the manufacture of DDT and BHC was established outside Delhi. Subsequently, a second factory was opened in the south Indian state of Kerala. The public sector Hindustan Insecticides Limited has an established capacity for manufacturing up to 10,000 metric tonnes of DDT.

However, the Delhi plant was ordered shut-down by the Supreme Court in 1996 as part of a judgment directing polluting industries in Delhi to relocate outside the National Capital Region.

DDT continues to be manufactured "solely" for the National Malaria Eradication Program. Usage of all other POP pesticides — aldrin, campechlor (toxaphene), Dieldrin, Chlordane and Heptachlor — have been banned, including BHC which was banned in 1997.

However, the bans have been slow in coming, and much damage is already done. At least one researcher has concluded that "Measured by tonnage, approximately 70 percent of all pesticides used on Indian farms are banned or severely restricted in the North, and identified by the World Health Organisations as extremely toxic or hazardous."[1] According to another estimate, nearly 350,000 tonnes of DDT and 575,000 tonnes of HCH have been used in India since 1985.[2]

Even now, what is banned is not necessarily out of the market. According to one farmer, the production technology for BHC and aldrin are so simple that even small producers can clandestinely manufacture it to order.[3] Moreover, many of the "banned" pesticides, particularly aldrin, show up regularly in Government records of exports.

Stockpiles

Pesticides: While it is uncertain as to the extent and types of pesticides stockpiled in the country, several sources indicated that barring a few pesticides with virtually no market, old pesticides

would most likely be released into the market in the form of substandard formulations.[4] This matches reports from Nepal and Bangladesh that substandard and banned pesticides often enter their countries from illegal formulators in India.

According to one source, the Ministry of Agriculture in the southern state of Tamilnadu had ordered the inventorying and destruction/disposal of stockpiled pesticides in its various regional and district warehouses about three years ago.[5] A petition for details regarding this exercise filed under the Tamilnadu Right to Information legislation by Chennai-based Consumer Action Group remained unanswered as of October 1998.

The various extensions of the Health departments, though, may still have substantial quantities of pesticides. However, it must be noted that as per affidavits submitted by various state pollution control boards to the Supreme Court in a matter pertaining to hazardous waste management, the state boards reported that none of them has even any facility to dispose hazardous wastes including POP chemicals.

PCBs:

The Ministry of Environment and Forests avers that no PCBs have been manufactured or imported into India since the 1960s.[6] It was also verified that Indian-built transformers have always used mineral oil. However, transformers and capacitors imported prior to the 1960s, and industrial equipment imported even subsequently may contain PCBs or may have contained PCBs.

If indeed no PCBs were imported or manufactured in the country, it is a mystery as to how PCBs show up in bioassays performed on mussels sampled at various locations along India's coastline. For instance, levels of upto 7.10 micrograms/gram (parts per million) of PCBs were found in mussels collected at an estuary near Madras, India.[7]

MAIN FINDINGS

India: Major Exporter of Life-threatening Chemicals

The continued production and formulation of POP pesticides in India is the single most important POPs-related problem for the country and the region as a whole. Reports indicate that clandestine manufacturing of several POPs pesticides may be contributing to illegal exports to Bangladesh and Nepal. As far as many Bangladeshi and Nepali activists are concerned India is to South Asia what the USA is to the world — a toxic imperialist.

Data gathered by Greenpeace also links Indian companies to exports of POP pesticides including aldrin, chlordane, heptachlor, DDT and BHC to a number of countries including nations where their use has long since been banned. [See Table]

Between April 1997 and January 1998, India exported 175,795 kilograms of DDT to Bangladesh, Japan, Nepal, New Zealand, Sri Lanka, Switzerland and UAE. Aldrin exports, which totalled 259,952 kilograms, were sent to 20 countries, including Australia, the Netherlands and the USA. However, officials from the Netherlands and Australia report that their records do not reflect these imports.

Interestingly, no single government agency contacted by us was able to provide a comprehensive picture of the status of production, usage and export of the POP chemicals. Only part of this has to do with their traditional reluctance to part with information that ought to be in the public domain.

For instance, aldrin's registration was withdrawn in 1996. But it is unclear whether production-for-export can continue legally. In fact, according to chemical industry databases, aldrin is not manufactured in India. However, aldrin continues to be exported regularly.

In November 1998, Greenpeace confirmed the availability of aldrin formulations in hardware stores in New Delhi. According to the shopkeeper, several manufacturers continue to supply the POP pesticide. "This is the best for killing termites; apply two coats of this to woodwork. . .it is poisonous only if you drink it," he said. The "Aldrin 30% EC" formulation was manufactured by Mumbai-based Adarsh Chemicals in October 1997 and is sold for Rs. 45 ($1) for a half-liter can.

Similarly, DDT's use was restricted to vector control through the National Malaria Eradication Program. The Government's stance is unclear on the export of a chemical produced solely for internal use in disease control. In any case, many countries which were shown as importers of Indian DDT are known to have banned the use of this chemical.

Interestingly, the Indian shipments of problem chemicals have failed to appear in the import data of at least two countries — Australia and Thailand. Official sources in both countries confirm that the shipments never arrived . . . or if they did, their records don't reflect the imports.

India's ongoing manufacture and exports of POP pesticides raises three important issues:

1. Continued environmental contamination around pesticide manufacturing or formulation units;
2. Continued exposure of workers to POPs in the work environment;
3. India's direct contribution to global environmental POPs contamination.

Unfortunately, chemical industries and their proponents in the government see stricter environmental norms as a hurdle placed in the way of realising the country's full potential in the exports of chemical products.[8]

Based on interviews in Nepal and Bangladesh, it also appears that export of POP pesticides, particularly of DDT, BHC and aldrin, may be far greater than what is reflected in official Indian statistics. Even government sources in Nepal and Bangladesh acknowledge that large quantities of chlorinated pesticides are smuggled across the porous land border. "Our success in pest management depends greatly on how well India implements its law. There's little we can do to stop the several formulators near UP (Uttar Pradesh) and Bihar from sending their formulations across the border," says Bharat Prasad Upadhyaya, chief plant protection officer in the Plant Protection Division of the His Majesty's Government of Nepal.

Mohammed Reazuddin, deputy director in Bangladesh' Department of Environment echoes the sentiment: "If pesticides that are not used in Bangladesh are used or produced in India, there is no use. There's a need for harmony in the registration process between India and Bangladesh because it's not possible to control border trade and market forces."

Besides the acknowledged POPs chemicals, India is also known to export other pesticides which either are potential POPs or may be contaminated with known POPs such as dioxins. Such chemicals include 2,4-D, Endosulfan, Sodium Pentachlorophenate and Lindane. India's exports of these chemicals in the period April 1997 to January 1998 totalled 2.02 million kilograms.

The ongoing exports may need to be viewed in light of the fact that not all the trade may be a result of Indian manufacture. At least one company, Mumbai-based PCI Ltd, is known to have purchased Heptachlor and Chlordane in anticipation of the October 1996 ban. Stocks valued at Rs. 5.58 million were in the company's possession as of 31.3.1997. A source close to the company claims that "This material was imported by the company knowing fully well of the impending ban which was stayed by a court. However, what is important at this stage is how the company plans to dispose of this impugned chemical. . .or whether the materials would be surreptitiously used in the services of termite control and/or in agricultural crop protection."[9]

India's Exports of Inorganic/Organic/Agrochemicals by Countries

For the Period April 1997 to January 1998

Source: Chemexcil, Mumbai

Name of Pesticide	Exported to	Quantity in Kg
BHC (no Lindane)	UK	21,600
DDT	Japan	3,500
DDT	Sri Lanka	25,200
DDT	Switzerland	6,500
DDT	UAE	23,000
Aldrin	Argentina	19,440
Aldrin	Australia	12,000
Aldrin	Belgium	15,710
Aldrin	China	4,000
Aldrin	Taiwan	4,840
Aldrin	Egypt	1,600
Aldrin	FRG	2,100
Aldrin	Hongkong	3,450
Aldrin	Ireland	18,750
Aldrin	Kenya	100
Aldrin	Malaysia	6,000
Aldrin	Netherlands	28,000
Aldrin	Nigeria	9,650
Aldrin	Oman	9,267
Aldrin	Singapore	8,144
Aldrin	Saudi Arabia	4,050
Aldrin	Sri Lanka	13,200
Aldrin	Thailand	12,540
Aldrin	Turkey	36,000
Aldrin	USA	51,086
Name of Pesticide	**Exported to**	**Quantity in Kg**
Aldrin	Vietnam	25
Chlordane	Hongkong	1,200
Chlordane	Vietnam	3,000
DDT (excl of previous heading)	Bangladesh	33,000
DDT (excl of previous heading)	Nepal	595
DDT (excl of previous heading)	New Zealand	24,000
Heptachlor	Greece	54,000
Lindane	Belgium	12,000
Lindane	Malaysia	15,100
Lindane	Netherlands	12,500
Lindane	Saudi Arabia	2,000

Name of Pesticide	Exported to	Quantity in Kg
Lindane	South Africa	19,000
Lindane	Spain	22,000
Lindane	USA	196,500
Endosulfan (Tech)	Argentina	187,125
Endosulfan (Tech)	Australia	174,375
Endosulfan (Tech)	Cyprus	1,195
Endosulfan (Tech)	Belgium	127,425
Endosulfan (Tech)	Chile	8,000
Endosulfan (Tech)	Costa Rica	5,025
Endosulfan (Tech)	France	3,000
Endosulfan (Tech)	Germany	29,000
Endosulfan (Tech)	Iran	67,500
Endosulfan (Tech)	Israel	14,625
Endosulfan (Tech)	Italy	2,000
Endosulfan (Tech)	Lebanon	5,000
Endosulfan (Tech)	Malaysia	208,225
Endosulfan (Tech)	Mali	28,000
Endosulfan (Tech)	Mexico	57,050
Endosulfan (Tech)	Netherlands	102,000
Endosulfan (Tech)	Saudi Arabia	6,361
Endosulfan (Tech)	Singapore	148,000
Endosulfan (Tech)	Spain	42,640
Endosulfan (Tech)	Sri Lanka	72,737
Endosulfan (Tech)	Taiwan	25,000
Endosulfan (Tech)	Thailand	46,625
Endosulfan (Tech)	Turkey	12,000
Endosulfan (Tech)	Uganda	3,300
Endosulfan (Tech)	UK	32,720
Endosulfan (Tech)	USA	176,875
Name of Pesticide	**Exported to**	**Quantity in Kg**
Endosulfan (Tech)	Uruguay	26,000
Endosulfan (Tech)	Vietnam	31,500
Sodium Pentachlorophenate	Belgium	30,000
Sodium Pentachlorophenate	Brazil	200
Sodium Pentachlorophenate	France	30,000
Sodium Pentachlorophenate	Hongkong	15,000
Sodium Pentachlorophenate	UK	15,000
Sodium Pentachlorophenate	Malaysia	15,000
Sodium Pentachlorophenate	Spain	12,000
Sodium Pentachlorophenate	USA	21,600
Sodium Pentachlorophenate	Zambia	500

Export of Organic/Miscellaneous Chemicals from India (April 1996 to January 1998)
Source: Informant, Mumbai

Month	Name of Pesticide	Country	Name of exporter	Quanti-ty in kg
Jun 1996	2,4 D Acid Tech	Iran	Metro Exporters Ltd	12,750
Mar 1997	2,4 D Acid Tech	Iran	Metro Export P Ltd	38,250
Oct 1997	Aldrin	Malaysia/Taiwan	Excel Industries Ltd	6 drums
Oct 1997	Aldrin	Qaboos (??)	Photo Chem India Ltd	2,636
Dec 1997	Aldrin	China	Excel Industries Ltd	1,620
Dec 1997	Aldrin	France	Excel Industries Ltd	192
Jun 1996	Benzene Hexa Chloride	UAE	Shadow Exports	14,025
Apr 1997	Heptachlor Tech	UAE	Pesticides India Ltd	17,200
May 1997	Hexa Chloro Benzene	South Africa	Indian Pesticides Ltd	1,000
Jul 1997	Hexa Chloro Cyclohexane	Thailand	Anshul Chemicals P Ltd	20,000
Nov 1997	Hexa Chloro Cyclohexane	Japan	Anshul Chemicals P Ltd	25
Nov 1997	Lindane	USA	Indian Pesticides Ltd	10,000
Dec 1997	Lindane	USA	Kanoria Chemicals & Inds Ltd	18,000
Jan 1998	Lindane	USA	Indian Pesticides Ltd	10,000
Jan 1998	Lindane	USA	Kanoria Chemicals & Inds Ltd	18,000
Jan 1998	Lindane	UAE	Skylark Exporters (Chennai)	17,500
Apr 1996	Lindane Tech	South Africa	India Pesticides Ltd	1,000
Apr 1996	Lindane Tech	Malaysia	Kanoria Chemicasls & Inds Ltd	4,000
Jul 1996	Lindane Tech	Malaysia	Kanoria Chemicals & Inds Ltd	3,000
Jul 1996	Lindane Tech	Israel	Rutmarg Commercial P Ltd	250
Dec 1996	Lindane Tech	Netherlands	India Pesticides P Ltd	1,000
Mar 1997	Lindane Tech	Malaysia	Kanoria Chemicals & Inds Ltd	3,000
May 1997	Lindane Tech	Malaysia	Indian Pesticides Ltd	6,000
Nov 1997	Lindane Tech	USA	Kanoria Chemicals & Inds Ltd	12,000
Dec 1997	Lindane Tech	Malaysia	Kanoria Chemicals & Inds Ltd	3,000
Dec 1997	Lindane Tech	USA	Kanoria Chemicals & Inds Ltd	12,000
Apr 1996	Sodium Pentachlorophenate	Zimbabwe	Excel Industries Ltd	12,000
Sep 1996	Sodium Pentachlorophenate	Ivory Coast	Excel Industries	15,000
Oct 1997	Sodium Pentachlorophenate	Malaysia	Excel Industries Ltd	300 drums
Oct 1997	Sodium Pentachlorophenate	UAE	Excel Industries Ltd	15,000

[1] Iyer R. The Chemical Industry in India: Occupational Hazards and Pollution. (1993) Center for Development and Environment, University of Oslo.

[2] The Hindu Survey of the Environment. 1991

[3] Personal interview with Mr. Navaneethakrishnan, farmer, Mettupalayam, Tamilnadu, September 10, 1998.

[4] Personal interview with Devinder Sharma, researcher/writer on agricultural issues, April 1998, New Delhi.

[5] Personal interview with K. Johnson, project officer, M.S. Swaminathan Research Foundation, Septemer 1998, Chennai.

[6] Personal interview with source at Ministry of Environment & Forests, New Delhi. 13 October, 1998.

[7] Ramesh A., Tanabe S., Subramaniyan A.N., Mohan D., Venugopalan V.K. and Tatsukawa R. (1990). Persistent Organochlorine Residues in Green Mussels from Coastal Waters of South India. Marine Pollution Bulletin Vol. 21 (12). pp.587-590

[8] UNCTAD (1993). Trade and Environment Linkages: The Case of India. Indira Gandhi Institute of Development Research, India.

[9] Written communication dated 6/10/97.

COUNTRY REPORT — NEPAL

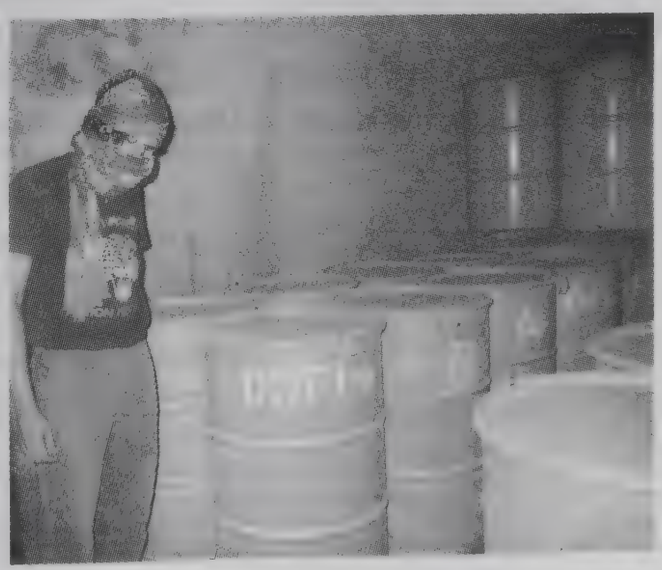
Pesticides

Nepal's beauty and exoticism is also its problem. Everybody wants to be there, including lending agencies. As one bureacrat puts it, "Nepal is the donor's darling." As a result, beginning in 1955, when the first consignment of BHC was imported from USA for vector control, not a year went by without pesticide donations from a variety of agencies, particularly USAID. At the time, the pesticides were probably a god-send that tremendously reduced malaria and kala ajar casualties.

Unfortunately, both DDT and BHC continued to be sent to the mountain kingdom in increasing quantities through the 1980s. Although, malathion and other shorter-life pesticides complemented DDT and BHC subsequently, exports of DDT to Nepal continued as recently as in 1997. In 1993, Indonesia which had recently banned the usage of DDT, exported 200 metric tonnes of DDT to Nepal.

Simultaneously, agricultural usage of pesticides also began an upward trend. Procurement was unorganised and unplanned and depended more on what was available or on manufacturers' sales pressure rather than actual needs.

Until recently, any pesticide that was registered in at least one other country could be legally used in Nepal. As a result, large quantities of pesticides, including highly hazardous ones, flooded the country. The porous land border with India, with its massive pesticides manufacturing industry, did not help any. With substandard pesticides from India finding an easy market among the unlettered peasants of the Nepali terai, Nepal's fledgling pest management program was in doldrums. "Our success in pest management depends greatly on how well India implements its law," says Nepal's chief plant protection officer Bharat Upadhyay.



According to the Chief Plant Protection Officer Upadhyay, "DDT and most Ocs [organochlorines] except Endosulfan are banned or not registered" under Nepal's new pesticide regulations. "Farmers continue to bring BHC from India for green bugs," he quickly adds. Upadhyay attributes the problem to the "several formulators near Uttar Pradesh and Bihar" in India who have set up mainly to cater to the casual transborder trade in the terai region.

Among the India-based suppliers of organochlorine pesticides in Nepal, the following stand out prominently:[1]

BHC: Bihar Mineral Industries; Krishi Rasayan.Aldrin: Bihar Mineral Industries; Krishi Rasayan; Rallis India; NOCILChlordane: Bihar Mineral IndustriesLindane: Krishi RasayanLindane + Carbaryl: Rhone Poulenc Agrochem (India) Ltd

NOTE: Some of the manufacturers may have now discontinued production and/or supply.

Some of the more acutely toxic substances such as endrin are reportedly used for poaching and fishing. Reports from the country's wilderness areas indicate that pesticides are also used by poachers.[2]

Nepal's most visible problem is its stockpiles of obsolete pesticides stored in at least five locations in the country. The problem was brought to public light by the Nepal Forum of Environmental Journalists. In a 1987 report for USAID, consultant William Klarman describes the stockpiles as "time bomb that can only lead to a major catastrophe if not corrected."[3]

Nepal's electrification program is dependent mainly on hydel power, a technology that relied entirely on imported technology and machinery. However, it is unknown whether any of the numerous electrical machinery in use and storage contain PCBs. It would be important, though, to ascertain whether PCB containing equipment exist in the country if one were to conceive a management and disposal plan.

MAIN FINDINGS

Nepal: Poisons In Paradise

Nepal enthusiasts from the North are often pleasantly surprised at the little Germanies, the mini Switzerlands and the Dutch-speaking tourist guides they encounter in the "pretty little hill kingdom." But few realise that their countries have also established a presence in a handful of stockpiles of hazardous and obsolete pesticides lying in dangerous conditions. Nearly 400 tons of degrading and highly toxic pesticides exported over the last three decades in the form of aid and trade by Northern lending agencies and multinational corporations are an ongoing cause of environmental contamination, and perhaps injury.

Amlekhgunj Stockpile: The largest stockpile is located in Amlekhgunj, near the Indian border to the South of Kathmandu. It is estimated that 50 tons of obsolete pesticides, including DDT, endrin, lindane, BHC, Chlordane, 2,4-D and other unidentified pesticides are stored in a warehouse abutting a primary school. In 1991, date expired pesticides from five regional centres were transferred to Amlekhgunj and stored in 200-liter lacquer-coated steel drums.[4] The Amlekhgunj warehouse, however, used to store pesticides even prior to 1991. Some of the pesticides in store were exhumed from an unsound burial site in the jungle. Reports allege that the burial site led to cattle and deer fatalities.

Table: List of organochlorine and organomercury pesticides stored at Amlekhgunj warehouse, Nepal

Pesticide Name	No. of containers	Quantity
Endrin liquid (liters)	19 drums	1200 liters
Organomercury	47 drums	7.4 tonnes
DDT dust	16 drums	3.2 tonnes
Lindane granules	3 drums	0.5 tonnes
BHC dust	25 drums	6.8 tonnes
Chlordane dust	5 drums	1.2 tonnes
2,4-D wettable powder	4 drums	1 tonne
Unidentified including OC pesticides	108 drums	22.5 tonnes

Source: HMG Ministry of Agriculture/Winrock International, 1994

Although, an effort has been made to contain the pesticides in sealed steel drums, pesticide spillage inside the drums has caused the corrosion of many drums. As a result, any efforts to move the drums or to repack the mixture of contents would require the employment of well-trained professionals with full security gear.

The villagers are clearly unhappy with their smelly neighbor. "The godown doesn't let us have a sound sleep. They have filled the godown with poisons and left it standing in the village. We're filled with fear that something might happen at night and our families will be wiped out in their entirety," laments Sahadev Bahadur Chetri, a villager who lives less than 500 meters from the warehouse.

"We want these poisons to be sent back to wherever they came from. Nepal is a member of the UN [United Nations]; let Nepal take it up in that forum," he recommends.

The Kathmandu Valley Stockpile: In the 5-ton stockpile in Nepal Agricultural Research Council's office in Kathmandu Valley, Greenpeace identified the following company names among the obsolete pesticides stored in leaking and ruptured containers:

- Bayer AG, Germany: Agallol 3 mercurial dip; Tindipterox fungicide; Folidol EC .05, Folithion Combi (contains DDT); Solbar - Barium Polysulphide; Teresan.
- DuPont, USA: Deenate; Marlate
- Shell, the Netherlands: dieldrin; endrex, Banner
- Hoechst, Germany: Morocide; Thiodan
- Velsicol, USA: VCS 50653 EC
- Sumithion 50 EC, Japan: Sumitomo Chemical
- Rhone Poulenc, France: Zolone EC
- Bharat Pulverising Mills, India: EDCT

This stockpile contains small containers and sacks of various pesticides in two rooms of a garage-like structure. The store is adjacent to an agricultural field and the nearest residential locality is more than 100 meters away. However, offices are located in the immediate vicinity of the store. The store is poorly ventilated, and a mixture of pesticides are strewn over the scrap wood and old furniture stored inside the room. Most labels are no longer readable.

Based on existing records, it is estimated that there are more than 70 tons of pesticides stored in small stocks in seven locations in Nepal. All the pesticides are imported, and most were donated. For instance, the dieldrin in the Kathmandu Valley stockpile discussed above is in a container that bears the label "Donated by US Consulate General in Calcutta for . . . US Operation Mission to Nepal. . ."

The lesser stockpiles:[5]

Name of Stockpile	Liquid (liters)	Solid (tons)
Cotton Development Board	9700	N/A
Nepalgunj	2220	8
Other districts	2222	11.9

Disposal: The Government too is not unwilling to tackle the crisis. Rather, they are unable to raise the resources or expertise required to deal with the problem. None of the corporations such as

Bayer, Hoechst, Shell, Velsicol, and possibly Indian companies, have come forward to take responsibility for their pesticides. Currently, the Asian Development Bank is extending its assistance and has drafted recommendations for containment, transportation, environmental impact assessment of disposal and disposal options.

However, the disposal options have come under some criticism. One earlier attempt to burn a portion of the organochlorines in a cement kiln in Hetauda had to be abandoned after the program met with staunch opposition from the trade unions and local residents and international environmental groups including Greenpeace. One ADB disposal expert later concurred with the environmentalists that the method (of cement kiln incineration) needed more testing before undertaking actual disposal.[6]

About 5.5 tons of organochlorines were disposed by burial and landspreading under high-tension electricity lines. Currently, the government is considering a variety of treatment/disposal options including incineration in cement kilns, incineration in a foreign facility, land-spreading, burial in the jungle, usage and reformulation.

Table : Pesticides disposed by burial or landspreading as of September 1991

Pesticide Name	Quantity (tonnes)
Lindane granules	2.06
Lindane (BHC) + carbaryl	1.64
Endosulfan	1.78
**Organomercury	1.30
2,4-D	23.41

**Note: The organomercury pesticides which were "mistakenly buried" were subsequently exhumed and are currently stored in the Amlekhgunj warehouse awaiting disposal.

The proposal to landspread even chlorinated pesticides poses a serious problem. However, the Asian Development Bank report refers to the method as following "the adage that "dilution is the solution to pollution."" The report further recommends that "All of the pesticides in Amlekhgunj, with the exception of organomercury fungicides, rodenticides and fumigants could be disposed in this manner but locations would differ slightly for some."[7]

Return-to-sender or taking the pesticides back to the exporter or exporting country is an option that has not been explored by Nepal. One hurdle to this option is India. Under the Basel Convention, India must be willing to allow transit for the pesticides from Nepal to the destination country. Interestingly, a closer examination of the origins of the pesticides in the stockpiles may reveal that Indian manufacturers stand cheek-to-jowl with Northern multinationals.

Recommendations:

The conditions in Nepal's stockpiles are very serious and need urgent international attention. Greenpeace recommends the following actions, keeping in mind the history and origins of the problems:

1. Every step of the exercise must be done openly and with the informed participation of communities, community groups and citizens.
2. Multinational and Indian pesticide suppliers to Nepal should immediately initiate a mechanism to fund the inventorying of all the obsolete pesticides in Nepal.

3. A similar mechanism, aided by funding agencies, should be set up to begin a systematic containment program for the pesticides. Even the pesticides "secured" in the Amlekhgunj warehouse are unsound, and may either need to be redone for storage or just before disposal.

4. Different pesticides may need to be disposed of using different destruction/disposal mechanisms. These need to be identified and implemented.

5. Technologies identified for destruction of stockpiles should not be polluting and should not produce other Persistent Organic Pollutants in the process. Ideally, the technologies should be set up close to the location of the stockpile, and should be removed immediately after the stockpile is destroyed. This is to avoid the destruction technology from becoming a magnet for hazardous wastes from the region.

---

[1] Dahal L. (1995). A Study on Pesticide Pollution in Nepal. National Conservation Strategy Implementation Project, Kathmandu.

[2] Personal interview with Gopal P. Upadhyay, chief warden, Royal Chitwan National Park, Kasara, Nepal. May 1998.

[3] Klarman W.L. (1987). Pesticide Use in Nepal, ARDP Consultancy Report No. 9, submitted to Winrock International Institute for Agricultural Development, USAID, Kathmandu.

[4] Asian Development Bank (October 1997). Implementation of the Pesticides Regulatory Framework TA#2808-NEP: Final Report. Vol.1 — Disposal and Implementation Plan.

[5] Asian Development Bank (October 1997). Implementation of the Pesticides Regulatory Framework TA No.2808-NEP. Vol 1: Disposal Implementation Plan. Kathmandu, Nepal.

[6] Asian Development Bank (October 1997). Implementation of the Pesticides Regulatory Framework TA No.2808-NEP. Vol 1: Disposal Implementation Plan. Kathmandu, Nepal.

[7] Asian Development Bank (October 1997). Implementation of the Pesticides Regulatory Framework TA No.2808-NEP. Vol 1: Disposal Implementation Plan. Kathmandu, Nepal.

COUNTRY REPORT — PAKISTAN

Not unlike in other Asian developing countries, pesticides are the starkest manifestation of the POPs problem in Pakistan. The South Asian nation continues to be a bulk importer of pesticides. However, the import and distribution has moved from being a Government subsidy-based monopoly to a mushrooming private business with a significant Northern multinational presence.

Pakistan's tryst with POP pesticides began in the 1950s when the federal government began importing DDT and BHC for malaria control and agriculture in Pakistan and East Pakistan (now Bangladesh). Subsequently, large quantities of dieldrin and aldrin (for desert locust epidemics) and other organochlorines were also added to the list. In the mid-to-late 1970s, the pesticide business was privatized. An agreement between the Government and pesticide corporations prevented further distribution of stocks remaining with the Government.

Privatisation and entry of multinationals boosted imports of all pesticides from Pakistani Rs. 162 million in 1980 to a turnover of Pakistani Rs. 9.9 billion in 1997.[1]

A poorly conceived import program aided by shortsighted donor agencies and profit-oriented pesticide corporations enthusiastically selling their formulations well in excess of local requirements has now led to a situation where degrading stockpiles of extremely hazardous pesticides are littered across the country. Even a casual visual inspection of any of the stockpiles will confirm that the poisons have entered the vitals of the life-support system in the vicinity and caused injury to local human and animal communities.

The tale of the pesticide stockpiles in Pakistan is one of shocking insensitivity on the part of the erstwhile Pakistani governments, pesticide manufacturers and donor agencies.

Pesticides:

Officially, all the POP pesticides except chlordane are banned for use and import. BHC was banned in 1997. However, in April 1998, Greenpeace was able to verify the availability of pesticides marketed as dieldrin, DDT, BHC and heptachlor. Samples of illegal pesticides, mostly unbranded and sold loose, were purchased and handed over to the Pakistan Environmental Protection Agency in Islamabad.

Ironically, local formulations by Lahore-based Welgreen Chemical P Ltd of heptachlor, a shortlisted POP manufactured by US-based corporation Velsicol, were being sold across the shop counter a few hundred meters from the Islamabad office of Pakistan Environment Protection Agency. The chemical appears in the 1994 list of banned pesticides.[2]

Dieldrin: In the Jodiya Bazaar area in Karachi, Greenpeace and Karachi-based NGO SCOPE witnessed chemicals — reported by the shopowner to be dieldrin — being transferred into 50 ml bottles by barehanded workers. In a report commissioned by Greenpeace, SCOPE identifies Pakistan-based Burma Shell as a "probable source" of this pesticide. "After its closure, most of the drums were taken away by laborers."

DDT: One shopkeeper confirmed that Chinese-made DDT was brought in bulk to Pakistan and repackaged in small sachets at the shop. DDT is reportedly also manufactured at Lahore-based Kala Shah Kaku, which was purchased by the owners of Finis. Finis is a popular brandname in Pakistan.

PCBs: The status of PCBs in use in Pakistan is unknown. According to Asif S. Khan of the Pak EPA, PCBs are not yet a known evil in Pakistan. "I suspect that there are historic oils that contain PCBs," he says. The Water and Power Development Authority owns the transformers and capacitors that were imported into the country during the initial stages of its electrification program. Unless an inventory is conducted, the true status of PCBs in the country will not be revealed.

MAIN FINDINGS

Pakistan: Dumps of Death

Hundreds of miniature Bhopals are happening in slow motion across the length of the country. The culprits: An estimated 1,935 stockpiles of obsolete pesticides located in 41 agriculturally active districts of Pakistan. The number of stockpiles are disputed, but all agree that the conditions under which the pesticides are kept in these stores are highly hazardous and causing visible damage.

Based on investigations and interviews conducted by Greenpeace and SCOPE, the following were identified as reasons for accumulation of stockpiled pesticides:

- Excessive, inappropriate and late arrival of donations;
- Leftovers from the former east Pakistan's stocks;
- Improper and prolonged storage of products with a short shelf-life;
- Transfer of sales from public to private sector which resulted in the obsolescence of the unused stocks in the Government's possession.

Dr. Zafar Altaf, chairman of the Pakistan Agriculture Research Corporation, places the blame squarely on the multinational chemical corporations. "MNCs sent aldrin and dieldrin to countries as aid to get people hooked on to it," he says. Another commentator, Lahore-based journalist Mr. Aurang Zeb says "Donor agencies hold the brief of certain multinational corporations."[3] According to Dr. Parvaiz Naim of IUCN, during the 1993 locust problem, Hoechst came forward with an offer of pesticides. "They also offered to arrange a donor," he said.[4]

Ballpark estimates place the quantity of obsolete pesticides between 2000 and 5000 tonnes. Contaminated containers and soil may add up to an extra 2000 tonnes.

Significant quantities of pesticides have disappeared either due to pilferage or due to "loss to the environment." In Sahiwal district of Punjab, it is estimated that "potentially up to 65,000 liters and 70 tons of various pesticides have been lost through leakage and container deterioration." The conditions at this site led one survey team to recommend that "No one should enter the compound except in an emergency."[5]

A 1987 survey undertaken by the World Environment Center, USA, concluded that: ". . .severe hazardous conditions exists at most locations and every effort should be made to alleviate the condition as soon as possible."

However, sections of the Pakistani bureaucracy are confident that the dumps don't pose a problem. "There's a lot of hue and cry about these pesticides. Most of these pesticides have lost their activity, and personally, I'm not scared," says Dr. Altaf of the Pakistan Agriculture Research Council.[6]

Dr. Altaf admits, though, that after the embargo on sale of pesticides by the government, the stocks were stored in offices or residences of the agricultural field assistants. "There were quite a few reports of children dying due to exposure," he says.

In April 1998 and July 1998, investigations were conducted by Greenpeace and SCOPE of the Malir stockpile, Karachi, and Multan, Shujabad and Lodhran stores in Punjab.

Malir stockpile, Karachi: The most visible and accessible of stockpiles, Malir is located on the national highway near the airport in Karachi. The dump is hemmed in by two schools and a densely populated area. The site stores pesticides belonging to the Punjab and Sindh Agricultural Departments.

Leaking pesticides — including endrin, sevin, diazinon — from corroded drums and open sacks have visibly spread over approximately 4000 square feet of land adjacent a railway line. In a nearby area, empty drums are stacked haphazardly. The area is also said to contain 1300 1-gallon containers of Kelthane MF in an advanced state of deterioration. An analysis conducted by HEJ Research Institute of Chemistry of water samples collected near the dump revealed "substantial quantities" of residues of solvirex and kelthane.

Table : List of liquid organochlorine pesticides stored at Malir stockpile, Karachi, Pakistan.

Pesticide Name	Location	Quantity (lit.)
Dieldrin 20%	Malir City	25.00
Dieldrin	Main store at Malir	96.00
Heptachlor	Malir City	8600.00
Kalthene (Kelthane?)	Malir City	10422.00
Kelthane 40%	Malir City	300.00
Thiodan 35%	Malir City	6832.50
TOTAL		26275.50

Note 1: Kelthane or dicofol could contain DDT.
Note: Total stocks of liquid pesticides (including all pesticides) totals 39,857 liters

Table : List of solid organochlorine pesticides stored at Malir stockpile, Karachi, Pakistan.

Pesticide Name	Location	Quantity (kg)
BHC 12.5%	Provincial store at Malir	20000.00
Sevidol 8.8% (contains BHC)	Provincial store at Malir	90.72
Total		20090.72

Note: Total stocks of solid pesticides (including all pesticides) totals 366.2 tonnes
Source: Assistant Director, Plant Protection, Dept of Agriculture, Karachi, 1992

Complaints from the adjacent school-cum-hostel have failed to evoke a response. "About a year and a half back, the girls started complaining of stomach aches. Some said their hair was falling. We called the experts and got the water examined. The well at the girls' hostel had to be sealed," the school headmaster says.

The local authorities are clearly ill-equipped to handle the containment of the toxic pesticides. Recently, the district court authorities, who had taken over the site for construction of an office building, ordered the removal of the chemicals by hand. Three laborers are reported to have fainted during the exercise.

Organochlorine pesticides known to be stored at the site include: dieldrin, heptachlor, thiodan (Hoechst) and BHC. A bulk of the pesticides were unidentifiable. The original list of pesticides stored at the site may, however, provide some indication. Among the pesticides, brandnames and/ or manufacturers that were identifiable during our inspection, the following were prominent:

- Padan Tech (50 kg cans): Takeda Chemical, Japan
- Furadan 39 (Granular)
- Dow Plictran 50 WP: Dow Chemicals, USA
- BP (Full form unknown): Several drums
- Banvel: Velsicol, USA
- 2,4-D 6-Topanol: ICI
- Dimethyl Tetra Chlorophthalate: Diamond Shamrock
- Newsidol
- Anthio
- Ekalux: Sandoz
- Solvirex

Multan: The store is located adjacent to a girls' school and residences. According to Amanullah Gill, a former employee of the Plant Protection Agency, the Multan stockpile is 20 years old. In 1979, "old" stocks reportedly sold to the Government by Bayer were brought to Multan for storage. However, Greenpeace was unable to confirm this. The 1987 World Environment Center report has additionally identified BHC and Sevin as being present in substantial quantities along with more 125 kg of Cynogas, viterex, dipterex, malathion and dimethoate.7

In 1982, the pesticides were sought to be disposed in the deserts of Cholistan by the Plant Protection Agency. The plan was abandoned following local protests and the intervention of the then president of United Arab Emirates.

Lodhran: The stores are located within the premises of an Agricultural department office. Detailed investigation was not conducted at this site; no POPs were identified.

E-150 WHO
COMMUNITY HEALTH C
LIBRARY AND DOCUMENTATION UNIT
BANGALORE

Disposal — Careful with the Cure

In 1990, the USAID was forced to abandon an attempt to dispose some pesticide wastes in a cement kiln in Dera Ghazi Khan. According to Dr. Naim of Karachi-based IUCN who witnessed the event, armed tribesmen concerned about the pollution that could result from burning the pesticides forced the USAID consultants to temporarily suspend their plans to burn the waste. Subsequently, however, the USAID reports that it test-burnt a small quantity of pesticides at the kiln.

In a critique conducted of cement kiln coincineration of hazardous wastes, researchers Lohse and Wulf-schnabel comment: "Stable operating conditions and a high incineration efficiency cannot be guaranteed during co-incineration of wastes. Under these circumstances, emissions of toxic organics such as polyhalogenated dioxins and furans, benzene and polycyclic aromatics cannot be effectively controlled."8 It is to be noted that Pakistan, like other South Asian Nations has an erratic and fluctuating power supply which can lead to increased hazardous emissions during start-up and cooldown. Also, most of the pesticides in Pakistan are mixed and in gel or solid form and not conducive for a steady introduction into any incinerator or cement kiln.

Another disposal program involves a Swiss company that has offered to donate an incinerator currently installed in Brazil to Pakistan, if it is found to be economically feasible.9

For the time being, and immediately, international donor agencies and the multinationals corporations whose chemicals are known to be among the stockpiles must participate in a joint effort to inventory and securely contain the leaking pesticides. In the meantime, a suitable disposal program should be identified that doesn't itself contribute to the generation of POPs or other life-threatening substances.

---

[1] Naz S.I. (1994). How Long Will We Import Pesticides? Dawn, February 19, 1994.

[2] Government of Pakistan (1994). The Gazette of Pakistan (Part II), Extra, SRO 930(1)/94. Minstry of Food, Agriculture and Livestock: Islamabad.

[3] Personal interview on 22 April, 1998, Press Club, Lahore, Pakistan.

[4] Personal interview on 23 April, 1998, IUCN, Karachi.

[5] Cusack J.G., Kruger R. and Napolitano S. (April 1987). Pakistan Pesticide Report: The Condition of Old Pesticides in Pakistan and Approaches to their Effective Management." World Environment Center, NY, USA.

[6] Personal interview on 20 April, 1998, Islamabad, Pakistan.

[7] Cusack J.G., Kruger R. and Napolitano S. (April 1987). Pakistan Pesticide Report: The Condition of Old Pesticides in Pakistan and Approaches to their Effective Management." World Environment Center, NY, USA.

[8] Lohse J. and Wulf-Schnabel J. (December 1996) Expertise on the Environmental Risks Associated with the Coincineration of Wastes in the Cement Kiln "Four E" of CBR Usine de Lixhe, Belgium. Report by Okopol for Greenpeace Netherlands.

[9] As revealed to SCOPE, Karachi, by a source who wished to remain anonymous. July 1998.

COUNTRY REPORT — THE PHILIPPINES

The Philippines faces a difficult problem in the storage and safe disposal of PCBs used in old transformers, many of which are still in use by the country's power generating units. The Philippines has no adequate treatment and disposal facility for hazardous wastes, and the standard practice by companies consists of illegal dumping, burning and in a few exceptional cases exporting the hazardous wastes abroad for incineration.

Pesticides: Almost all the POPs pesticides shortlisted by the UNEP have already been banned in the Philippines, with the exception of chlordane whose use is restricted to termite control purposes. Unfortunately, instead of having the desired effect of minimizing its use by the public, chlordane has become more accessible and can be purchased in any hardware store in the Philippines with very little trouble.

From time to time, reports surface about the continued sale and use in the countryside of some of the already banned pesticides. Authorities claim that illegal pesticides are available because of the smuggling of such substances into the country via the Southern backdoor from Indonesia or Malaysia.

The Philippine government has consistently brought to the attention of the UNEP, in the context of the POPs negotiations, the inclusion of endosulfan, also an organochlorine, in the list of POPs being targeted for international action.

This was after the Philippine government banned endosulfan, following recommendations from local technical experts which cite the pesticide as the country's leading cause of poisoning among agricultural workers. Such action was taken by the government in recognition of its own weakness and lack of infrastructure to monitor the purchase and application of the pesticide at the field level. Banning the pesticide and stopping its distribution in the market was therefore seen by the government as the only effective means of preventing the pesticide's adverse environmental and health effects.[1]

Implementation of this decision, though, was delayed by the multinational chemical company Hoechst which manufactured the Endosulfan formulation in question. Rather than act responsibly and in the interests of human and environmental health, chemical corporations have repeatedly sought to protect their profits at all costs. Such actions could negate and derail any positive POPs elimination programs in developing countries.

The same dynamic could also be seen in the case of the toxic legacy left behind by the United States in its former military bases in the Philippines. Several studies suggest that aside from

serious contaminants like heavy metals and radioactive materials, these bases are also severely contaminated with several POP chemicals.

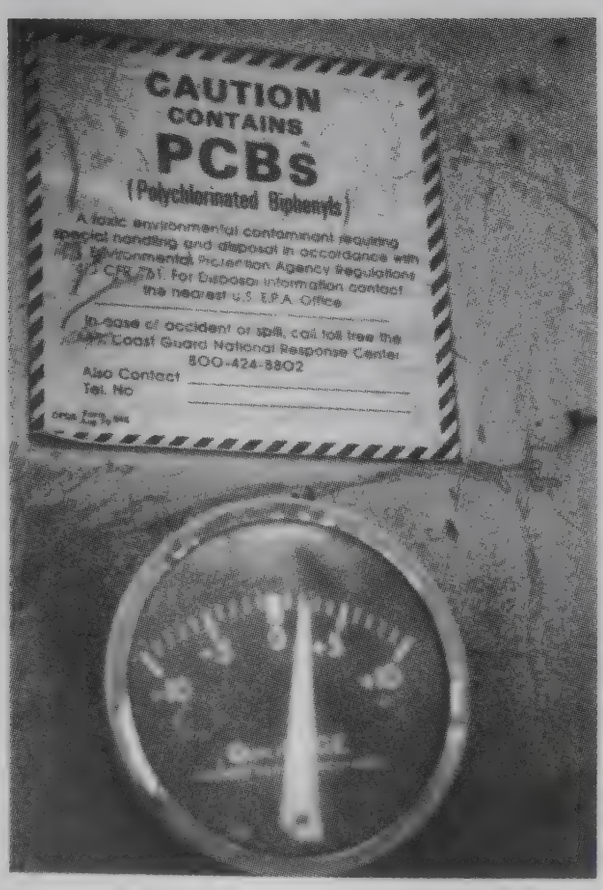
PCBs: The National Power Corporation (NAPOCOR), the largest power generating entity in the country, together with the National Electrification Authority (NEA), and provincial and city power generating utilities, have been pinpointed as the remaining and main repositories of PCBs in the country. A United Nations Development Programme (UNDP) funded study in 1996 estimates a total of 2,000 to 3,000 tonnes of PCB oil in the country still in use or in storage pending final disposal.[2]

The UNDP study also says that some PCB wastes have in the past been exported for high temperature incineration overseas, particularly in the Rechem hazardous waste facility in the United Kingdom. In 1996, for example, the Manila Electric Company (MERALCO) exported PCB oil from its abandoned Rockwell Power Plant in Makati, Metro Manila. The 15.5 hectare site of the Rockwell plant was being considered for re-development into a mixed residential and commercial zone, but environmental authorities refused to give clearance to the project unless the PCB contamination issue is addressed by the plant owners.

The site has since undergone initial clean-up operations costing about 15 million pesos (@$350,000 as per October 1998 exchange rates).

The company hired environmental consultants which found very high levels of PCBs in several places inside the facility. For example, high PCB concentrations in the soil ranging from 30,000 ppm to 45,000 ppm were found in certain localized areas inside the plant. Experts estimate that an additional 50 million pesos may be required to dispose of at least 2,000 cubic meters of PCB-contaminated soil now stockpiled in a temporary soil storage facility inside the plant.

The contamination at Rockwell is indicative of the poor and haphazard practices prevalent in many other old power plants in the country. The problem is further compounded by lack of awareness about the dangers of PCBs, despite the fact that their importation and use has been banned in the country since the 1980s. The Philippine Center for Investigative Journalism reports in a 1997 article that some local power cooperatives still burn their PCB waste, and that workers routinely dip their naked hands in PCB oil when repairing old and busted transformers.[3]


CAUTION
CONTAINS
PCBs
(Polychlorinated Biphenyls)
A toxic environmental contaminant requiring special handling and disposal in accordance with
Environmental Protection Agency regulations
CFR 761. For Disposal information contact
the nearest U.S. E.P.A. Office.
In case of accident or spill, call toll free the
U.S. Coast Guard National Response Center
800-424-8802
Also Contact
Tel. No

According to the same report, during the 1970s, some workers even used PCB oil as an insecticide in their homes. In some instances, leaking PCB containing transformers owned by NAPOCOR were given to private contractors who offered to dispose of the waste. While the exact fate of the PCB in these transformers remain unknown, they presumably ended up being dumped, burned, or re-used in recycled transformers.

Without question, the considerable amounts of PCB waste anticipated from the decommissioning

of old transformers presents a huge problem for the state-owned NAPOCOR and other users of PCB oiled transformers and capacitors. However, instead of taking the responsible approach to this problem which is to inventory all PCB stocks in their facilities and provide for temporary safe storage for leaking transformers, the NAPOCOR has decided to adopt a reticent approach, by consistently evading all questions about its PCB stockpiles. It has even successfully managed to escape compliance from a Philippine law on toxic wastes and hazardous substances that requires firms to disclose information to the government on their inventory of toxic wastes and substances.

When Greenpeace approached NAPOCOR to inquire about its PCB inventory, company officials claimed they were doing something about the problem, but refused to divulge details. This is not reassuring especially in light of present plans by NAPOCOR to retire 14 old thermal power plants in the main island of Luzon and 20 similar plants nationwide. Moreover, current government plans to privatize NAPOCOR could motivate NAPOCOR to sweep the PCB problem under the rug, considering that the matter represents a tremendous liability that could chill investor interest in the company.

In regard to the eventual destruction of PCB oils and contaminated equipment and material, recommendations of international agencies also present cause for worry. A 1992 World Bank funded study on pollution control and industrial efficiency[4] and a 1995 European Commission supported study on hazardous waste management[5] both recommend the installation of an integrated, treatment, storage and disposal facility, including an incinerator, for hazardous wastes. A hazardous waste incinerator installed, even if not dedicated to destroying PCB wastes, will be seen by the local authorities as an easy way to "dispose" or treat PCB wastes.

A 1996 UNDP-funded study on PCBs recommended high temperature incineration including cement kiln incineration for the disposal of PCB waste.[6] This is particularly worrisome for the Philippines given the evolving evidence of contamination around similar facilities even in countries with stricter regulation such as the UK, France, Germany and Japan.

MAIN FINDINGS

The US Military's Toxic War Against the Philippines

After almost a century of military presence in its former colony, the United States was forced to withdraw from its military bases in the Philippines (Clark Air Base and Subic Naval Base) in 1991 after the Philippine Senate rejected an extension of the RP-US bases treaty in 1991. When the Americans left Clark and Subic, it soon became apparent that they also left behind a lethal legacy of toxic wastes brought about by their use, storage and disposal of hazardous materials including POPs such as PCBs and organochlorine pesticides.

A report made by the US General Accounting Office (GAO) in January 1992[7] revealed that the US military has failed to comply with its own environmental standards in its bases in the Philippines and that as a consequence, cleaning-up the damage left behind in both bases could reach Superfund proportions.

Other subsequent studies outline a preponderance of evidence suggesting serious environmental contamination in both bases which pose serious health risks to workers and communities.

More recently, the Philippine government which has undertaken extensive efforts to convert the former bases into flagship economic centers, commissioned environmental baseline studies in

both Clark and Subic to determine the actual extent of contamination. The Clark study which was conducted by Weston International[8] reported that:

- high levels of the persistent pesticide dieldrin was found in four operational wells and two back-up wells inside Clark, fueling fears that the underground drinking water supply inside and outside the bases is also contaminated. The dieldrin contamination could be a result of breakdown of the organochlorine pesticide aldrin which may have been used in the golf course. The wells containing dieldrin are all located near or downgradient of the golf course;

- high levels of aldrin, dieldrin, lindane, chlordane, heptachlor and HCB were also found in the soil samples from several sites including a municipal landfill located near a residential area in the town of Mabalacat; an abandoned motor pool now used as a relocation site for evacuees of the Mt. Pinatubo volcanic eruption; in the old fire training area; and in the Civil Engineering Entomology center;

- elevated levels of PCB in soil were detected in the old decommissioned power plant and transformer sites, with one site recording a high of 7,800 parts per million.

The People's Task Force for a Bases Clean-up, a Manila-based NGO, has pushed for US responsibility in the clean-up of its former bases in the Philippines. According to this group, the Weston study, although limited in scope, amply validates fears of extensive contamination in Clark with the findings providing only a "window to a much bigger problem." Meanwhile, communities living near the base continue to be exposed to highly poisonous pollutants. The findings of the study may also explain the high incidence of children born with abnormalities and impaired intelligence in the communities living near the bases.

In a letter to President Fidel Ramos, Dr. Rosalie Bertell, president of the International Institute of Concern for Public Health, asserted that "the level of kidney diseases and symptoms of kidney problems reported in this area is startlingly high."[9] The Institute is engaged in monitoring the health of over 700 households in the near vicinity of Clark.

The Philippine government has been very laid back in pushing the US to assume responsibility for the toxic wastes its forces left behind. Worse, Philippine base conversion authorities, especially during the term of President Fidel Ramos, have demonstrated a tendency to downplay the contamination problem, probably apprehensive of the possibility that this might scare away investors and locators in the former bases.

This propensity to downplay the problem is very obvious in the case of Subic where the Subic Bay Metropolitan Authority (SBMA) commissioned Woodward Clyde, an environmental consulting firm to do an environmental baseline study (EBS).[10]

The Woodward-Clyde study which was financed by a $650,000 loan from the World Bank did not identify widespread severe contamination in the former naval base. The base conversion authorities used these findings to describe the problem in Subic as "minimal."

However, a subsequent review of the Woodward-Clyde study undertaken by Clearwater Revival Company (CRC), an American based environmental consulting firm with expertise in toxic waste remediation and base conversion issues stated that "the EBS does not accurately characterize contamination at the Subic Bay Freeport Zone, and the potential for adverse impacts to human health and the environment."[11] Describing the report as "terribly designed", Dr. Paul Bloom, a noted soil scientist identified with the United States Working Group for Philippine Bases Clean-up , said that

the EBS "was an attempt to spend the most amount of money to produce the least amount of results."

Among other issues, CRC said that the study done by Woodward-Clyde fails in its objective to establish a baseline for environmental quality because it did not assess all areas of the Freeport Zone, especially those that had been previously determined to be contaminated such as housing areas and hazardous materials storage areas where the presence of PCBs, pesticides, lead, unexploded ordnance, and oil had been identified.

The baseline study also failed to measure contaminants in the former naval base's sewer system where hazardous materials such as chlorinated solvents, PCBs, and contaminated solids were reportedly discharged by the US Navy in the past. It also failed to look into the environmental consequences of the burning of hazardous wastes and their use as fuels in the incinerator and old power stations inside the facility. No testing for dioxins and other bioaccumulative substances has been done in or near these identified areas.

There are many other omissions in the Woodward-Clyde study – most of which are failures to investigate and account for recorded pollutive practices by the US Navy in Subic . Retired Admiral Eugene Carroll, a 37 -year US Navy Veteran who used to command US carriers and battleships into Subic referred to such dirty practices when he admitted how the US Navy was "endlessly producing industrial toxic chemicals and discarding them without due regard for the pollution (in Subic)."

In a 1992 article published by the Philippine Center for Investigative Journalism (PCIJ),[12] Carroll recalls how the US Navy routinely flushed and left behind trails of waste and toxic materials in the process of ship repair. The PCIJ article also revealed the double standard applied by the US, particularly in the use of PCBs in transformers which have been banned in the US since 1976. Filipino base workers said they dealt with PCB-contaminated material without adequate protection, with the knowledge of their American superiors.

To date, the official American response to this issue has been that of denial, stressing at every turn that it is under no legal obligation to pay and provide for the clean-up of its former bases in the Philippines, even though it has paid and conducted full remediation of its other bases in Europe and Japan. As elsewhere, and especially in poor countries, polluters, the US government in this case, should pay.

---

[1] Philippine Case Study: A Developing Country's Perspective on Persistent Organic Pollutants, paper presented by the Philippine government during the Intergovernmental Forum on Chemical Safety (IFCS) Experts Meeting on POPs, 17-19 July 1996, Manila, Philippines.

[2] Graham, R., Polychlorinated Biphenyl (PCB) Waste Management and Land Contamination in the Philippines , UNDP, 8 November 1996.

[3] Tielens, C., and Severino, H., " Napocor's Dirty Secret" , Philippine Center for investigative Journalism , March 17, 1997)

[4] MEIP/ Industrial Efficiency and Pollution Control (IEPC) programme. Final Report of Metro Manila Study, Metropolitan Environmental Improvement Program., World Bank, 1992.

[5] Entec Europe Ltd., Toxic and Hazardous Waste Management Project: Phase 1 report to the Government of the Philippines, Commission of the European Communities, September 1995.

[6] Graham, R. UNDP (1996).

[7] "Military Base Closures: US Financial Obligations in the Philippines," U.S. General Accounting Office (GAO/NSIAD-92-51, January 1992).

[8] Soil and Baseline Study Report., prepared by Weston International for the Clark Development Corporation, Philippines, August 1997.

[9] Letter written by Dr. Rosalie Bertell to President Fidel Ramos and the People's Task Force for Bases Clean-up dated October 9, 1997.

[10] Environmental Baseline Study, Final Report prepared by Woodward-Clyde for the Subic Bay Metropolitan Authority, Olongapo city, Philippines, August 1996.

[11] Environmental Baseline Survey of Former United States Navy Installation, Subic bay, Philippines; An Arc Ecology Technical Review produced for the People's Task Force for Bases Clean-up, with analysis provided by the Clearwater Revival Company (CRC), 1998.

[12] Pimentel, B., and Lasola, L., "Toxic Sunset", Philippine Center for Investigative Journalism, November 1992.

COUNTRY REPORT — THAILAND

As of 1996, Thailand had banned all shortlisted POPs pesticides. However, chlordane, which was banned in 1996, was available in the markets in Chiang Mai as recently as August 1998. A government source who wished to remain anonymous indicated that the Thai Armed Forces still has stocks of old DDT, especially in the densely forested border areas. If this is indeed the case, immediate inventorying and containment of the old stocks must be conducted in order to avoid escape into the environment.

According to one source, many of the banned pesticides including DDT and BHC are freely used in the uplands near Chiang Mai in Northern Thailand. According to this source, some of these pesticides come in packaging with Chinese marking via the Thai-Myanmar border.[1]

Moreover, at least 12.5 tonnes of Aldrin and 20 tonnes of hexachlorocyclohexane (HCH) are known to have been exported to Thailand from India in 1997-98.[2]

Obsolete Pesticides

Approximately one ton of various pesticides including some organochlorine chemicals are stored in a shed in the premises of the Agricultural Toxics Substances Division in Kasetsart University. According to the director of the Division's Pesticides Research Laboratory, Khun Nualsri, the pesticides are leftovers from samples taken from the market for quality verification. Every year, nearly 1 ton of pesticides accumulates with the Division.[3]

The pesticides, stored in a shed, with metal grills in the place of two walls, are located within the University campus near areas frequented by large numbers of students and other visitors. The pesticides and their containers seemed to be in good condition and showed no visible signs of leakage. However, given the sensitivity of the area where they are currently stored, it is advisable to immediately contain them and remove them to a less populated area to await eventual disposal.

Currently, a proposal is in the pipeline to avail of GTZ assistance for a 1 ton/year incinerator. No further details were available regarding this proposal.

The staff at the division were not clear as to the disposal method used for earlier stocks. Nualsri, however, indicated that "two-to-three years ago," a stock of similarly accumulated pesticides were disposed of by burial at an agriculture experimental station in Uttaradit in Sukhothai. Burial, particularly for persistent substances, is an ineffective method of containment. "Constituents in

buried wastes can and do escape into the surrounding environment, primarily through leaching into groundwater and volatilising into the air."[4]

According to the United Nations Food and Agricultural Organisation (FAO), "Many countries that buried pesticides in the past are now experiencing severe environmental contamination and facing huge costs to recover the pesticides and to mitigate damage to the environment and public health."[5]

Given the facts, the burial site in Uttaradit could be a potential POPs hotspot, and very likely a source of pesticide contamination in nearby areas.

PCBs

PCBs were banned for use in 1975. However, some government sources say that PCBs may still be imported for industrial use or as part of industrial equipment.[6]

Thailand already recognises the PCB-containing or contaminated electrical equipment in its electric utility to be a "major existing hazardous waste of concern."[7] Thailand's electrification program, driven by the World Bank-funded Electricity Generating Authority of Thailand (EGAT), has relied heavily on imports of equipment from Northern countries. Fortunately, Thai authorities are in a position to identify at least some of the equipment which contain or may have contained PCB oils.

MAIN FINDINGS

PCB Wastes: Where there's a Will, but no Way

In July 1998, Greenpeace identified a site storing old transformers and capacitors in the Bangyai branch of the Metropolitan Electricity Authority, Bangkok. Although it was not possible to verify whether the equipment used to contain PCBs, at least some of the equipment were specially marked with a red dot. The storage was in the open and most of the equipment were fully or partially drained. There were visible signs of leakage around some equipment. If this site does contain PCBs, it could be a very significant point source for PCBs. Volatilisation of PCBs from storage sites is particularly problematic in tropical climates.

This was verified by Watanabe et al[8] at a storage site in Bangkok for PCB-containing transformers and capacitors owned by the Electricity Generating Authority of Thailand. Immediately downwind of the storage site, the average PCB concentration in the air was 280 nanograms per cubic meter (ng/m3). The PCB concentration was 570 ng/m3 some 5 meters upwind. These levels are roughly 1000 times greater than those measured in urban air in the United Kingdom[9] and from 15,000 to 48,000 times greater than those measured in the Arctic air.[10]

This site, we were told, no longer exists. The contents of this site were reportedly removed to an unknown location, and the site, which is likely to be contaminated, was currently being used to stored equipment and material for highways construction. We were unable to investigate these transformers.

All the PCB-containing transformers and capacitors — some of which are still in use — are either in the custody of the EGAT, the Provincial Electricity Authority (PEA) or the Metropolitan Electricity Authority (MEA). The latter, which is responsible for electricity distribution in the Bangkok metropolitan region, has reportedly removed all PCB-containing capacitors from service and has stored them in steel containers awaiting disposal.[11] The PEA estimates that a further 30,000 transformers and capacitors could be potentially contaminated.

A 1987 inventory conducted by EGAT and the PEA provides the only available estimate of the quantity of PCBs and PCB-contaminated electrical equipment in Thailand.

PCB Containing Transformers Owned By EGAT

In Operation	Spares	Retired	Total
1165	188	534	1887

Source: EGAT (1987)

PCB Oil in EGAT Transformers (Askarel)

Number of Transformers	Askarel Content (liters)
33	45,060

Source: EGAT (1987)

PCB-contaminated equipment (in tons)

Equipment	EGAT	MEA	PEA	TOTAL
Large transformer	148	—	—	148
Small transformer	—	8	2020	2028
Capacitors	188	6	98	292
Total	336	14	2118	2468

SOURCE: EGAT (1987)

A portion of these wastes have already been disposed in offshore facilities. According to Boon-Long, Thailand exported 153 tons of PCB wastes to EMC Service in France. The EGAT exported 240 tons during 1994-1996; the MEA shipped 166 tons in 1994 to France; and Ekarat Engineering Co. Ltd exported 30 tons in 1996 to a hazardous waste facility in the UK.

---

[1] Interview with Sirin Virajsirin, Northern Regional Environmental Office, Chiang Mai, 25.7.98.

[2] Source: Chemexcil, Mumbai, and Informant database, Mumbai.

[3] Interview with Khun Nualsri, Director, Pesticides Research Laboratory, Kasetsart University, Bangkok. 23.7.98.

[4] Costner P. with inputs from Luscombe D. and Simpson M. (October 1998). Technical Criteria for the Destruction of Stockpiled Persistent Organic Pollutants. Greenpeace.

[5] United Nations Food and Agricultural Organisation. (1996). Disposal of Bulk Quantities of Obsolete Pesticides in Developing Countries.

[6] Interview with Dr. Jarupong Boonlong, Pollution Control Department, Bangkok, July 1998.

[7] Interview with Dr. Monthip Tabucanon, Environmental Quality Promotion Department, Bangkok, 27.7.98.

[8] Watanabe S., Laovakul W., Boonyathumanondh R., Tabucanon M.S. and Ohgaki S. (1996) Concentrations and Composition of PCB Congeners in the Air Around Stored Used Capacitors Containing PCB Insulator Oil in a Suburb of Bangkok, Thailand. Environmental Pollution

Vol. 91 (3). pp.289-297.

[9] Halsall C., Burnett V., Davis B., Jones P., Pettit C. and Jones K. (1993). PCBs and PAHs in UK Urban

Air. Chemosphere 26: 2185-2197. As cited in Costner P. et al (1998) "Technical Criteria for the Destruction of Stockpiled Persistent Organic Pollutants." Greenpeace.

[10] Halsall C., Stern G., Bailey R., Barrie L., Muir D., Fellin P., Rosenberg B. and Grift N. (1997). Polychlorinated biphenyls (PCBs) and Organochlorine Pesticides in the Arctic Atmosphere. Organohalogen Compounds 33:225-229. As cited in Costner P. et al (1998) "Technical Criteria for the Destruction of Stockpiled Persistent Organic Pollutants." Greenpeace.

[11] Boon-Long J. Managing POPs in Thailand. Published in UNEP, Proceedings of the Subregional Awareness Raising Workshop on Persistent Organic Pollutants. Bangkok, 25-28 November, 1997.

COUNTRY REPORT — VIETNAM

All the POPs pesticides shortlisted by the UNEP have already been banned in Vietnam since 1992, although government authorities acknowledge the possibility of illegal entry into the country of some of these banned pesticides through its porous borders shared with China, Cambodia, and Laos. Prior to the enactment of the Regulation on Pesticide Registration which established effective controls for the importation and use of pesticides in Vietnam, the country imported its pesticides from the former USSR, China, and Eastern Europe.

More than pesticides, a key concern among government authorities is the proper management and disposal of PCB stocks, particularly in old transformers decaying in the country's aging power stations. PCB wastes, according to government officials have in the past been routinely discharged into the environment as a consequence of transformer repair, recycling and maintenance operations. It is estimated that total PCBs and contaminated equipment in Vietnam could fall between 27,000 to 30,000 tons.[1]

As a consequence of poor management and disposal practices, PCBs, long banned for importation into Vietnam, have been detected in soils in dumping sites (73.285 ppm) and a former power plant site (18.81 ppm) in Hanoi.[2]

But without doubt the greatest threat from persistent pollutants being faced by Vietnam would still be the legacy of widespread dioxin contamination especially in the South as a direct result of American herbicide spraying operations during the Second Indochina War (between 1961 to 1975). More than two decades after the war, the impacts on the environment and human health of the dioxin-tainted Agent Orange continue to be felt in Vietnam.

MAIN FINDINGS

Toxic Legacies of an Irresponsible Superpower

An estimated 72 million liters of herbicides were sprayed by the United States in wide areas in South Vietnam during the "Vietnam" war under its Operation Ranch Hand, which consisted of defoliation missions and forest destruction operations designed to cut off food supplies to Vietnamese soldiers, expose their lairs, and clear vegetation along river channels to facilitate entry of US supply ships to Ho Chi Minh city.

Of the total amounts of herbicides used by the US, Agent Orange accounted for 60 % or around 42 million liters.[3] The dioxin content of Agent Orange, a mixture of the herbicides 2,4,5-T and 2,4-D, averaged 3.83 g/cubic meter, although some batches contained 10 and 20 times this amount.[4] On this basis, it is estimated that a total of 170 kg of dioxin was released into the environment in the South of Vietnam during the war.[5]

The enormous amounts of dioxin-tainted herbicides sprayed in Vietnam has converted extensive forest and agricultural patches in the South into virtual laboratories where consequences of dioxin exposure are apparent to this day. Indeed, more than twenty years after the war, evidence remains of widespread disruption and degradation of productive ecosystems as well as of continuing human health complications. Many of the health effects have begun to manifest themselves in the offspring of Vietnamese who were exposed to Agent Orange.

According to a World Bank report on Vietnam, estimates concerning the extent of land damaged by the war range from 100,000 hectares to 2 million hectares.[6] The loss of forest resources, biodiversity erosion and destruction of agricultural lands are identified as direct consequences of the defoliation operations.

Spraying operations went hand in hand with bombing missions whose direct outcome aside from killing people was the formation of huge craters which eventually became breeding grounds for malaria carrying mosquitoes. Consequently, this led to greater use of DDT in the country. In some instances, the American military dumped entire payloads of pesticides exposing limited areas to high dosages. This practice took place some 50 times during the war, 30 of which involved agent Orange.[7]

Because dioxins, like other persistent poisons travel through the environment and build up in the food chain, consumption of dioxin-tainted food represented an additional exposure route to residents of South Vietnam. Tests conducted between the period 1985 to 1987 on food and wildlife samples collected in markets in Southern Vietnam confirm elevated high levels of dioxins.[8]

Several epidemiological studies have already been done by Vietnamese and foreign scientists to show human health problems believed to be linked to Agent Orange exposure. The evidence presented by these studies establish among others that higher rates of liver cancer, soft tissue sarcoma, choriocarcinoma is more commonly observed in people living in sprayed areas as well as in North Vietnam war veterans exposed to Agent Orange. Moreover, the rates of abnormalities during pregnancies (e.g. miscarriages, stillbirths, birth defects, and hyditiform mole) were higher in people living in sprayed areas as well as in families of exposed war veterans.[9]

Of serious concern are dioxin levels found in breast milk, and blood. In breast milk samples collected among lactating women in sprayed areas of South Vietnam, the levels of dioxin have decreased from up to 1450 parts per trillion (ppt) in the 1970s to the 1993 level of about 10-20 ppt.

However, these levels of dioxin concentration in breast milk are still much higher than those found in breast milk from the non-sprayed areas of North Vietnam and exceeds values in industrialized countries by 3 to 8 times.[10]

In another study, all blood samples taken in the South had higher levels of dioxin than the ones taken in the North.[11] The study showed a correlation between dioxin levels in the blood taken in adults living for a long time in a given area and the quantity of Agent Orange sprayed.

As evidence worldwide mounts on the real effects of dioxin — which the WHO classifies as a human carcinogen and which is considered by the US Environmental Protection Agency (EPA) in its latest re-assessment of dioxin to be 200,000 times more lethal than DDT — the connection between the spraying of Agent Orange and the impacts on exposed Vietnamese and American war veterans will become much clearer.

In the final analysis, the burden of compensating people for the damage to the environment and human health brought about by the actions of the US military, should be made to fall on the US government and the manufacturers of Agent Orange including Diamond Shamrock Chemicals Company, Occidental Chemical Corporation, Dow Chemical Company, Monsanto, Uniroyal, Inc., Hercules, Inc. and the Thompson Hayward Chemical Co.

The World Bank , however, maintains that "although there is documented evidence of increased dioxin levels in Vietnamese from many parts of the country, no definitive association has been shown with the wartime application of herbicides." Admitting helplessness about Vietnam's problem, the Bank then states that "other than continuing to support research, there is little that can be done specifically for this problem."[12]

It is hoped that the World Bank disposition on this matter is not indicative of the attitude of the US government. Because if that is the case, the world is likely to witness yet another massive cover-up of one of the biggest crimes against the environment and humanity.

---

[1] Do Tham Bai and Pham Hung Viet , "Contamination by Transformer Oil PCBs and Risk Assessment," paper delivered for Ecological Risk Assessment conference sponsored by UNIDO, South Korea, April 1998.

[2] Do Tham Bai, et. al., 1998.

[3] Known herbicide expenditures against South Viet Nam from 1961 to 1971 were 70.72 million liters - of which approx. 60% was agent Orange, according to Westing. The most commonly quoted figure is 72 mil. L which includes Cambodian and Laos missions)

[4] Westing, A. , Herbicides in War, the Long-term Ecological and Human Consequences,. SIPRI, 1984, p.14.

[5] Westing ., 1984., p.16.

[6] Viet Nam: Environmental Program and Policy Priorities for a Socialist Economy in Transition., the World Bank, Agricultural and Environmental Operations Division , East Asia and Pacific Region. June 1995.

[7] Westing., 1984, p.15.

[8] Schecter et al. Chlorinated Dioxin and Dibenzofuran Levels in Food and Wildlife Samples in the North and South of Viet Nam. Chemosphere, vol. 19, nos. 1-6, pp 493-496, 1989.

[9] Le Cao Dai, "The Long Term Consequences of Agent Orange/Dioxin on Human Health in Vietnam," reported in National Conference on Dioxin , Hanoi, 1993.

[11] Le cao Dai, et.al., "Analytical Study of Breast Milk Contaminated with Dioxin in South Vietnam", in Herbicides in War, The Long-term Effects on Man and Nature, 2nd International Symposium, Hanoi, November 1993.

[12] Le Cao Dai, et. al., "Remarks on the Dioxin Levels in Human pooled Blood from various Localities of Vietnam" in Herbicides in War, the Long-term Effects on Man and Nature , 2nd International Symposium, Hanoi, November 1993.

[14] Viet Nam: Environmental Program and Policy Priorities for a Socialist Economy in Transition., the World Bank Agricultural and Environmental Operations Division , East Asia and Pacific Region. June 1995.

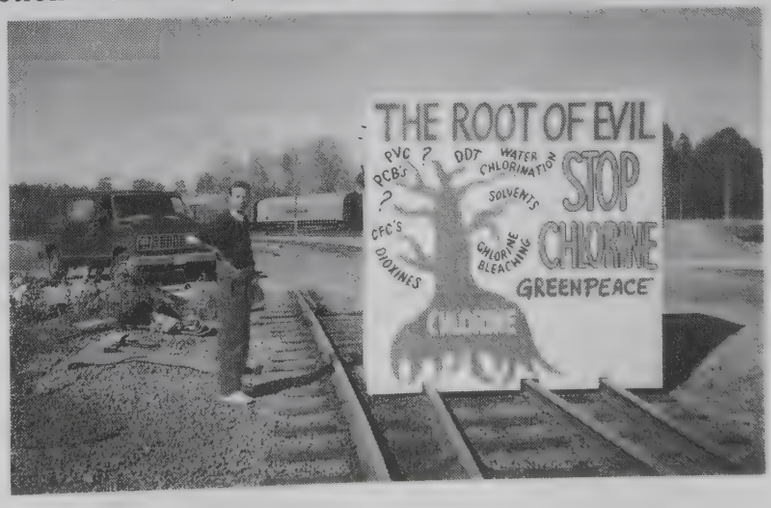
CONCLUSIONS AND RECOMMENDATIONS

The problem of POPs pollution in Asia — be it the historic problem of obsolete pesticides or of continued production of persistent chemicals, or proposed expansion of POPs producing technologies — is too large, complicated and expensive for individual Asian nations to handle. International action that stresses shared responsibilities among countries is the only effective way to deal with a problem with such transboundary implications.

The ongoing international process under the UNEP umbrella to create a legally-binding instrument to eliminate POPs presents a suitable fora for Asian countries to develop the necessary wherewithal to deal with their existing POPs problems. However, it is important to bear in mind that while governments are responsible for taking action against POPs contamination, the liabilities associated with such action must always fall on the polluter and not on the citizens, who have already endured the consequences of toxics pollution.

Any action on POPs must take into account the difficulties faced by developing country governments, especially in the provision of financial and technical resources to deal with POPs pollution and the availability of non-chemical alternatives for certain remaining uses of POPs. An orderly, equitable and just transition must be ensured as alternatives to POPs are introduced. In some cases, financial and technical assistance will be required to enable technology transfer, or to help build the capacity to employ clean methods for crop protection, vector control, the production of goods and/or the destruction of POP stockpiles.

Moreover, the emerging instrument must include and promote strategies that would encourage the implementation of clean production worldwide, enable developing countries to stop POPs pollution within their borders, and prevent the transfer of the Western POPs producing industrial model to industrializing countries. A schizophrenic situation where POPs sources are being eliminated in one part of the globe and promoted in another is untenable and should not be allowed to continue. In short, a global POPs agreement must facilitate the transition to clean production on a global



BOX # 1

Greenpeace Policy on Management and De-toxification of POPs and other Organochlorine Chemicals

No Incineration : Organochlorines must not be allowed under any circumstances, to be dispersed into the environment through direct dumping or the use of dangerous and inadequate disposal technologies such as incineration.

Secure Storage : Secure storage of toxic waste must be considered the first step in a comprehensive program to identify and develop suitable and safe de-toxification for individual waste streams. Secure storage is defined as a place where segregated waste streams are stored in purpose built, above ground facilities which incorporate:

- high security measures
- the ability to monitor and retrieve chemicals in storage
- zero emissions to water, soil, and atmosphere
- rigorous and routine inspections
- emergency response program

Strict Regulation: Strict precautionary measures must be taken to prevent environmental and human health damage which could result from an accident, leak, spill, fire, explosion, or natural disasters. Storage facilities must be designed with a view to facilitate future methods of detoxification;

Closed Loop Destruction : Systems and technologies for the safe de-toxificationof chemicals must be designed to be closed-loop and avoid the release of toxic chemicals into the environment;

On-Site Treatment : Mobile detoxification systems which are taken to a contaminated site must be removed upon completion of de-toxification and not remain in-situ where the system could be used to import and dispose of other waste streams;

Responsibility and Accountability: Original producers of banned chemicals , where they can be traced, must be liable for the storage, collection, and disposal and the full cost of the entire de-toxification program;

Community-Right-to-Know: Full access to information on all aspects of the detoxification program, including the technologies used, alternatives considered, monitoring data at storage and detoxification sites, must be made freely and easily available to the public.

Alternative destruction technologies: A number of alternative POPs destruction technologies are now on offer. Many of these processes, while not perfect, present a better alternative than incineration or cement-kiln burning. A detailed assessment of the various POPs destruction technologies is the subject of an October 1998 Greenpeace report titled *"Technical Criteria for the Destruction of Stockpiled Persistent Organic Pollutants."* Copies of the report can be obtained by writing to any of the addresses given in the inside cover.

scale and prevent the migration of dirty technologies from rich to poor countries. Developing countries should be given the opportunity and the wherewithal to by-pass dirty technologies and material, and build an economy reliant on clean and sustainable products and processes.

Agenda 21 explicitly calls for: "the phasing out or banning of toxic chemicals that pose an unreasonable and otherwise unmanageable risk to human health and the environment, including those that are toxic, persistent and bioaccummulative and whose use cannot be adequately controlled." On this basis, the goal of the emerging POPs Convention must be that of elimination. Concretely this would entail the following:

1. For intentionally produced POPs chemicals such as pesticides, all production, usage and trade must be phased-out in a rapid and orderly manner, taking into account the specific requirements of developing countries ;
2. For stockpiles of obsolete POP chemicals, immediate action should be taken to identify, inventory and contain them. Disposal of POPs stockpiles should be done in a manner that does not give rise to other POP chemicals or pose a hazard to the environment and human health. Systems and technologies for the safe de-toxification of chemicals must be designed to be closed-loop and avoid the release of POPs and other toxic chemicals into the environment. Organochlorines must not be allowed, under any circumstances, to be dispersed into the environment through direct dumping or the use of dangerous and inadequate disposal technologies such as incineration.
3. Secure storage of POP stockpiles must be considered the first step in a comprehensive program to identify and develop suitable and safe de-toxification methods. Secure storage would entail the institution of high security measures; a system that would allow monitoring and retrieval of chemicals in storage; zero emissions to water, soil, and atmosphere; rigorous and routine inspections; and an emergency response program.
4. Storage facilities must be designed with a view to facilitate future methods of detoxification. More importantly, original producers of banned chemicals , where they can be traced, must be liable for the storage, collection, and disposal and the full cost of the entire de-toxification program.
5. For identified POP hotspots or contaminated sites, polluters must be made to shoulder the responsibility for their proper clean-up and remediation. The POPs instrument should have a mechanism to ensure that polluters, be they governments or corporations, face-up to their moral obligation to assist victim communities in cleaning-up contaminated sites;
6. For POPs, such as dioxins and furans and HCBs, which are unintentional by-products of certain processes and activities, all significant human-made sources should be identified and phased-out either through process changes, or by product substitution in the case of material like PVC plastic. In this regard, industrial and waste disposal practices that generate dioxin and other persistent pollutants should be changed or replaced with dioxin-free processes. Chlorine-free bleaching should replace chlorine-based bleaching technologies. Waste incineration should be avoided. Chlorine-containing feedstocks in industrial processes should be replaced with cleaner substitutes.

Recommendations

Greenpeace believes that in the long run, the success of the global POPs elimination strategy lies in the embodiment and elaboration of the following principles in emerging international processes and instruments on POPs:

Polluter Pays and Extended Producer Responsibility:

This applies particularly to the problem of stockpiled pesticides and PCB-containing electrical equipment. Most of the stockpiled pesticides and PCB-containing equipment were imported into Asia over the last five decades. Producers of the pesticides, PCBs and PCB-containing equipment are morally and financially liable to pay for the clean -up of pollution caused by their operations.

Corporations who have profited from the production and sale of POPs must be made accountable/ liable for the toxic legacies of their commercial practice by — financing and carrying out the proper inventorying, containment and disposal of obsolete pesticides, and the clean-up of contaminated sites.

Extended producer or corporate responsibility is the application of the polluter pays principle to products. In concrete terms, it means the producers (which may include importers and retailers) must participate directly in the management of their products once the latter reach the end of their useful life. This would have the effect of integrating the full social and environmental costs into production proceses. Simply put, the responsibility for waste problems associated with products rests with their producers. Measures to achieve waste reduction should become part of an overall materials policy focusing on the life cycles of products and their constituent materials. EPR goes hand-in hand with the phasing out of hazardous materials that pose unacceptable risks to the environment and human health such as chlorinated pesticides and PVC.

Pollution Prevention and the Preventative Approach

New chemicals released into the market should be screened to ensure that they are not POPs or do not generate a POP during their manufacture, use or disposal. The burden of proof should lie on those who stand to gain from the production and marketing of the chemical or product. Phasing-out a chemical or production process once it is released is economically and politically expensive, particularly in developing countries. Adopting the precautionary principle and reversing the burden of proof would protect developing country governments.

In light of this concern, particular attention must be paid to the proposed expansion of PVC manufacturing, waste incineration, chlorinated pulp and paper bleaching proceses, and other products of chlorine chemistry. Armed with the knowledge of the potential effects of such technologies, governments in Asia are now obliged to inform their citizens of the kinds of industries being promoted in the country and to take anticipatory action to prevent the expansion of POPs-producing technologies.

The precautionary principle requires that materials should not be discharged unless it can be established that they will have no negative impact on the environment. This approach also recognises the "limitations of scientific knowledge in determining if the use of a chemical or an industrial activity should proceed." Rather than ignore science, the precautionary approach suggests that industrial production also has social and health impacts, and that other public decision makers — not just scientists — must be involved.

This approach avoids the problems and limitations of our understanding of toxicology by removing the assumption of a safe level of a particular compound in the environment. Applied to POPS, international action must be based on the understanding that the global ecosystem has in reality, no (zero) capacity to deal with POPs originating out of human activities.

Effective global action on POPs, therefore, must have as its ultimate goal the cessation of production and/or generation of all anthropogenic POPs. Environmental management approaches or end-of-pipe pollution control measures are not applicable to POPs.

Despite the overwhelming evidence, the chemical industry continues to emphasise risk management exercises. "Once a chemical has been determined to be a POP, the procedures of risk management must be proposed to reduce the risk to an acceptable level. These procedures should include all available management options and must be cost-effective. Proposals for substitution, ban or phase-out must be considered as a last resort" according the the Global Crop Protection Federation, an association of multinational companies manufacturing pest and weed-killing chemicals.

However, with what is known about the hazards of POP chemicals, the industry's position amounts to a call for a grand biological experiment with the world's population of humans and other species as guinea pigs.

The preventative approach to pollution maintains that it is cheaper to prevent environmental damage than to attempt to manage or 'cure' it. Prevention requires going upstream in the production process to prevent the source of the problem instead of attempting damage control downstream. Pollution prevention replaces pollution control.

Right To Know

One of the key problems confronting pollution prevention and toxic reductions is the lack of information. In Asia, very little information is available on toxic waste being generated and released by industrial operations. Despite the disastrous gas leak at Union Carbide's pesticide factory in Bhopa in December 1984, Bhopal residents are denied access to even information concerning the quality of groundwater surrounding the Carbide's killer factory.

Communities have no idea what poisons they are being exposed to. Without this information, communities cannot assess the true risks of specific industrial operations to the environment and human health . Armed with information, public participation is a powerful catalyst for the adoption of cleaner production methods. Governments are key in ensuring public access to information by providing the legal framework and the corresponding mechanisms that would support disclosure of information, mandatory reporting of environmental information, and free access to data. The institution of a national toxic use and release inventory, for one, would not only assist governments to identify POPs and other toxic pollution sources — but would also help put pressure on polluting companies to reduce and eventually abandon the use of toxic chemicals in their operations.

Clean Production

In the end, the ultimate goal should be to achieve clean production which is non-toxic, free of hazardous waste, energy efficient, and socially useful. Clean production implements the Precautionary Principle and acknowledges the need for public participation in political and economic decision-making. Clean production assures us of our fundamental right to a safe, healthy and toxics-free future.